BALLY MANUFACTURING CORPORATION, a Delaware corporation,

Plaintiff/Counterdefendant,

vs.

D. GOTTLIEB & CO., a corporation, WILLIAMS ELECTRONICS, INC., a corporation, and ROCKWELL INTERNATIONAL CORPORATION,

Defendants/Counterplaintiffs.

Docket No. 78 C 2246

Chicago, Illinois
January 26, 1984
11:35 a.m.

VOLUME X-A
TRANSCRIPT OF PROCEEDINGS
BEFORE THE HONORABLE JOHN F. GRADY

TRANSCRIPT ORDERED BY: MR. JEROLD B. SCHNAYER
MR. MELVIN M. GOLDENBERG

APPEARANCES:

For the Plaintiff/
Counterdefendant:

MR. KATZ
MR. SCHNAYER
MR. TONE
MS. SIGEL

For the Defendants/
Counterplaintiffs:

MR. LYNCH
MR. HARDING
MR. SYDNEY M. LEACH
MR. GOLDENBERG
MR. ELLIOTT
MR. RIFKIN
MR. GOTTLIEB

Court Reporter:

LAURA M. BRENNAN
219 South Dearborn Street, Room 1918
Chicago, Illinois 60604

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(The following proceedings were had in open Court:)

THE COURT: Good morning.

MR. LYNCH: Good morning, your Honor.

MT. TONE: Good morning, your Honor.

THE CLERK: 78 C 2246, Bally v. Gottlieb, case on trial.

MR. SCHNAYER: Please take the witness stand.

Your Honor, I busted one of my glasses a couple of minutes ago. I have a lens missing. So I will try and proceed.

THE COURT: All right.

MR. SCHNAYER: Thank you.

JAMES SCHOEFFLER, PLAINTIFF'S WITNESS, PREVIOUSLY SWORN.

DIRECT EXAMINATION (Continued)

BY MR. SCHNAYER:

Q Dr. Schoeffler, at my request, did you prepare a summary of your conclusions as you previously testified about with respect to the coverage of the representative claims literally and by equivalence of the Flicker, Fireball, and Freedom pin-ball games?

A Yes, sir. I did.

Q I will show you Plaintiff's Exhibit PX-460 and ask you what that is.

A This is the summary of the claims reading on the pin-ball games, Flicker, Fireball, and Freedom, that I prepared.

Q Dr. Schoeffler, at my request, did you also prepare a summary of your conclusions, as you previously testified about, with respect to the infringement of the representative claims literally and by equivalence as to the defendants' representative pinball games?

A Yes, I did.

Q I show you PX-459 and ask you what this is.

A This is a summary of the representative claims of the defendants and the claims that read on those games that I prepared.

Q Dr. Schoeffler, on Tuesday as I asked you questions about the references that the defendants had referred to in their Section 282 notice, when we got to the eighth level, there was some confusion as to the references which were actually included in that level.

I will now ask you some questions about the two articles that are actually contained in that eighth level.

I will show you Plaintiff's Exhibit 461, which includes pages 81 through 95 of an Electronics magazine article dated April 18, 1974.

This includes an article entitled, "Single Chip Microprocessor Opens Up a New World of Applications," which is contained on pages 81 to 87, and a second article which is entitled, "End Channel MOS Technology Yields New Generation of Microcomputers," and which is contained on

pages 88 to 95.

Referring to the first article, have you had an occasion to review it?

A. Yes, sir. I have.

Q. Do you have a belief as to whether the first article teaches the invention of Claim 45 or any of the other representative claims?

A. Yes, sir. I do.

Q. What is that belief?

A. I don't believe that this article teaches the invention of Claim 45 or any of the other representative claims.

Q. Could you please explain.

A. Yes, sir.

This is an article from Electronics magazine that is discussing the applications for microprocessors. And I will just refer to briefly a couple of comments that I found should be brought up here.

On Page 82 of the article, in the third paragraph --

THE COURT: Page what?

THE WITNESS: 82, your Honor.

BY THE WITNESS:

A. -- the statement is made at the beginning of the third paragraph:

> "The implications of such cheap distributed one-quarter horse computer power are only beginning to be understood."

And this articule is dated April of '74.

And that statement is consistent with my understanding of the state of the art in 1974 among digital logic designers, namely, that the microprocessor was becoming available and applications were being suggested, but really what it could do and how it could be done was just beginning

to be studied.

Now, at the end of that same column there is a statement that says:

> "A microprocessor control system already is operating in experimental automobiles monitoring dozens of operational parameters at a potential component cost of less than $200."

In April of '74 that had to be the microprocessor controlled effort for engine control done, being done by the Ford Motor Research Laboratory, and I was heavily involved as a consultant throughout that time, from a couple of years before up through about 1976.

And that sentence in this popular article is very much misleading.

For example, the potential component cost of less than $200 refers to the component cost of the electronic circuits in the microcomputer itself, but is based on the assumption that it would be in full production, buying about 4 million of them a year; whereas the actual ones being purchased were exceedingly expensive.

Since this article is directed toward existing microprocessors of the day, this sentence is -- implies that the microprocessors available to engineers at that time could actually carry out that application.

That's not true.

The particular microprocessor that was in that automobile was a custom designed microprocessor, very, very much faster than anything that was available on the commercial marketplace at that time. Extremely capable.

It was so complex to produce that microprocessor that when in the course of the project it was desired to buy 50 or so of them just to test out automobiles on the road with the control system in them, no U.S. semiconductor manufacturer was capable of producing them. And, in fact, the only source of supply turned out to be a company in Japan, and all the original models were custom built in Japan.

That microprocessor, even the inside of it, the detailed instructions, were specifically specified for the control systems in that car.

So it is not a typical microcomputer application at all.

The scope of the project was so different from anything that we can conceive of in, for example, a pinball game area. The people who were carrying out that project were, without exception, Ph.D. engineers who were extremely experienced, not only in the computer industry but also in the application area. Namely, they knew automobils and automobile engines and the control of engines.

And so they were in a position to understand and appreciate the problems of the car in carrying it out.

Now, to bring it to the point where that car would drive -- I drove this car myself with this computer in it -- probably took about four years of effort on the part of these people. That adds up to about 45 man years of effort

just to get to the stage where this thing was working.

Now, I think more relevant to the point of the pinball game is not the microcomputer itself and its sophistication, but what had to be done to make it work within the car itself.

In a pinball game, when you install a microcomputer control system in it, because of the economics, we're stuck with those same switches, those same lights and the same digits and the same targets and all the characteristics that we've mentioned many times.

In the automobile the noise situation was such that that computer would not have been able to control the engine of the car under those conditions. And as a consequence many major changes were made to the automobile.

And that's what's misleading about this statement.

Actually, the $200 cost of the computer, if that were real, is nothing compared to the cost of the external circuitry and devices that actually would have had to have been put on that car to use it.

So in a survey article like this, talking about new microprocessors, to allude to an application like that as though anyone could pick up the microprocessor and do it -- you know, it's sort of obvious to do -- is, in my opinion, just very misleading.

And it goes along with the sort of hype of the day, namely, microprocessors have great potential, almost any application in the world ought to be served by them, with no indication of the difficulties that are involved.

Q. Were you involved in that project at Ford specifically?

A. Yes, I was involved with that project.

Q. And besides the dozen or so Ph.D. engineers, were there other staff that worked on that project?

A. Oh, yes, a project like that that goes on over a long period of time requires an enormous staff just to carry out the tests which go for days and days and things of this nature. So, there were, I have no idea of the total dollars involved, but it is not the same kind of effort we are talking about in using a computer to control a pinball game or any other comparable industrial product.

Continuing on, in the second column, the third paragraph starting with, "Using software programs to affect the behavior of the processor instead of hardware interconnections may be an unfamiliar technique to many circuit designers." I agree with that statement. It is an unfamiliar technique, and that is what makes the design of a real time application involving a microprocessor so difficult and the result of this invention then so impressive.

And then the last sentence is in the same vein there, "Designing systems with microprocessors is still largely uncharted."

In April of '74, that is a very, very true statement. Some rules of thumb are beginning to emerge and that, too, is true.

The applications to instrumentation in calculator-like applications were being documented at tha time.

On Page 83, in the first column, a list of applications is noted there, just ahead of the headline, "How to Choose a Microprocessor", and in there is listed game machines. Again, there is no detail. This is not a technical article. And so its purpose is not to show an engineer how he would go about designing an application. I is for, again, a manager who wants to get a picture of what microprocessors are and how they might impact as products in his organization and what he might be looking forward to in the future.

The remainder of the article starts with that "How to Choose a Microprocessor" and then is a discussion of various microprocessors that are available, what the tradeoffs are on, for example, the very simple one that was used in Flicker versus some more advanced ones, and things of this nature. But in general, the article does not teach the invention in any way.

Q Do you believe that this article is more relevant than any of the other technical references that we previously discussed?

A I don't believe this article is a technical reference, and so I don't believe it is as relevant as any of the

technical references we have discussed.

Q. Now, Dr. Schoeffler, referring to the second article in Plaintiff's Exhibit 461, i.e., the article entitled, "MOS Technology Yields New Generation of Microprocessors", and starting at Page 88, have you had an occasion to review this article?

A. Yes, I have.

Q. Do you have a belief as to whether this article teaches the invention of Claim 45 or any other representative claims?

A. I don't believe that this article teaches the invention of Claim 45 or any of the other representative claims.

Q. Could you please explain?

A. Yes, sir.

This article is almost totally directed toward a discussion of a new microprocessor that was just coming on the market --

THE COURT: Let me get this article. Which volume is it in?

MR. SCHNAYER: It is the second volume.

MR. GOLDENBERG: Your Honor, I am not too sure it is in that volume, unless they have changed the volume.

MR. KATZ: Here it is.

THE COURT: I might as well get it in the book.

MR. SCHNAYER: There were some pages missing.

Remember yesterday we had a discussion, there were some pages missing? That's the article we have there.

THE COURT: Oh, that's the one I already have?

MR. SCHNAYER: Yes, that's the second article.

THE COURT: Oh, the second part of it?

There's two separate articles back to back. That was the confusion, because it's only listed with the title of the first one.

MR. GOLDENBERG: Here is the original of that.

THE COURT: I might as well just use this. Thank you.

THE COURT: All right, thank you. Go ahead.

THE WITNESS: Should I continue?

BY MR. SCHNAYER:

Q Continue with your answer, please.

A This article is written by some people from Motorola Semiconductor Products in Phoenix, Arizona, about their own products, which are just -- were just being announced. This is April of 1974, this new Motorola 68 microprocessor and the other vendor-supplied chips that would go with this system.

This microprocessor actually was later used in some of the later games that we have already talked about. But it is directed essentially toward a discussion of these chips and their capabilities and what Motorola expected from this.

Specific comments about it toward the end of the first column, the last sentence there says:

"These input/output chips enable the CPU;" that is, the central processor chip of the computer, "to control a large variety of industrial and communications equipment."

They then list:

"Process and manufacturing control systems, peripheral and terminal hardware, parameter control systems of all types from microcomputers in the automobile to control systems for traffic

lights and anywhere else that random logic computer control needs optimizing."

I think that is a little ambitious kind of a statement to make. It is not true. This microprocessor, in the first place, was not even readily available at this time. It is my recollection that, in fact, that parts could actually be used in development of products not until the beginning of the following year and that it had not been used in any of these applications. So it was more of the case of we hope it could be used.

This microprocessor is much too slow for the automobile control system as a specific example, and that is easy to see.

At the top of the next page, page 90, in the first paragraph, the second sentence says:

"Over 70 instructions may be available in the Intel 4004 that was used in Flicker as a comparison."

There were, I believe, 46 instructions available.

So this is a more powerful machine and faster than the 4004, but the wording, "Over 70 instructions may be available," is reminiscent of the warning that Dr. Vacroux gave yesterday in his notes to those engineers taking that course; namely, that many of these products were being pre-announced, and it was dangerous to assume, first, that they actually would

ever hit the marketplace, but, secondly, even if they did, that they would actually meet the specifications.

Things were moving rapidly at this time, and he was warning them of that at that time.

At the top of the next column is a statement that I would totally disagree with, and that is the statement that says:

"Design changes, too, are simply a case of modifying the control program in contrast to designing and laying out the logic afresh."

This,in my opinion, is a very misleading statement, and so that anyone who is using this article to learn from would really be led astray here. What this statement implies is that if you take the Motorola microcomputer system itself, and every pinball game we have talked about has a microcomputer system, but around it are all of these other pieces of electronics that attach to the switches, the lights, the digits, the solenoids, et cetera, with all of the noise immunity, noise prevention, all of these other things.

What this statement is implying is that if you use a Motorola set of chips that you can just build your hardware and then solve all your problems in software, you will never have to change it again. You will just rewrite the programs if it is not working all right. That is absolutely incorrect.

The situation in reality is that what you put in the hardware and what you put in the software program are trade-offs, and the two have to work together hand in glove in order to make an application come into being successfully.

For example, we have dwelled on things like the low beta transistors and the slow turn-on of the currents in the lamps. Those are in the hardware, and they are in the hardware so that the software can do its noise immunity. If you fouled up and did not put that into the hardware because you did not realize noise was a problem, it does not matter

how clever you are in the program. You are going to go back again and make changes.

If I would come back just once more to that Ford Motor automobile control problem, the real complexity in that system was not the microcomputer. It had to be very fast, all right, but that was developed, and that worked fine. The complexity and the thing that took four years to get the intiial one working satisfactorily, so it could go on into product development -- it was not sold for a great many years even after that -- was all of the things around it. To make it work reliably in an automobile, all those external electronics in that noise environment was a very tough problem to overcome.

Now, the last thing that I will mention here is the diagram at the bottom of page 90, that same page, which is a rather superficial block diagram of an application. Within the square or rectangle in the center of that diagram, the little blocks labeled CPU, ROM, RAM, peripheral interface adapter, -- there are four of those -- and communication interface adapter, those are all the chips, individual chips, that Motorola builds that go along with this microcomputer.

So, in effect, that square in the middle of Figure 6 is the microcomputer itself.

Then it shows connected to the microcomputer a point of sale keyboard input, credit authorization, some-

thing labeled A, B, C, D, E, F, G -- I do not know what that is -- retail processor center, and a dataphone, with no details at all of any of the electronics that must be present to interface external devices to that computer and to make it work properly.

Now, if you look at what the text says about this figure, it is on page 93, and it is the last sentence in Column 1, and what it says is:

> "Consider the block diagram of a typical small terminal, a generalized point of sale terminal, Figure 6."

As best I can tell, there are no more words about that figure; that is, it now goes on to discuss that every computer needs peripherals and other things, but the whole discussion of that figure seems to be missing from this article. So the figure is there, and it is not used for no good reason at all.

It's clear this is not a technical article that is attempting to teach anyone anything, in my opinion, and it certainly does not contribute to the teaching of the invention as a whole.

Q. Dr. Schoeffler, I refer you to Figure 1 on Page 88, and ask you to explain what that figure shows.

THE COURT: What page?

MR. SCHNAYER: 88, your Honor. That's the first page.

BY THE WITNESS:

A. The legend at the bottom indicates that this figure is a diagram that shows an example of the Motorola 6800 family of components.

The word "family of components" is pretty common terminology used to mean the various chips that go into the microcomputer.

And it's shown connected to -- all of the chips are in the microcomputer except the two little boxes on the lower right which are lebeled, "Matrix Keyboard with 64 Keys," and a printer.

Q. Now, Dr. Schoeffler, I refer you to the large exhibits PX 421-A and -F, and ask you what they are?

A. These -- here's 421-A -- to -F? -- 421-B, -C, -F.

These are the diagrams we used in the discussion of Disco Fever when we were talking about the

infringement of the Williams Disco Fever machine.

BY MR. SCHNAYER:

Q. What microprocessor was used in the Disco Fever pinball machines?

A. That machine uses the processor that's discussed in this article. It's a Motorola 6800.

It is shown right here on Exhibit 421-A, and labeled IC-1.

And there are several peripheral interface adapters; the PI chips that are used as, for example, IC-18 on the same diagram.

Q. Does Figure 1 of this article on Page 88, which shows the Motorola 6800, as used in the Williams Disco Fever pinball game teach the design of the electronics of the Disco Fever?

A. I don't believe that it teaches how to design the Disco Fever at all.

Q. Please explain.

A. The portion of the system that is the microcomputer itself, namely Motorola's family of chips, which are shown here, if you stretched a point you might say it taught that.

But in fact, there's not enough detail in this article; and anyone who is going to design Disco Fever would actually go to the Motorola manual, which would show better the interconnection of all of these

details, lines, and so on, to connect the Motorola chip itself.

But the major difference between this diagram -- and the reason I called it superficial and used the word "dangerous" with diagrams like this, is the complete lack of indication of all of the electronics that are not part of the microcomputer itself.

Here is one of those poor little PIA chips; and over here on the right is this large amount of circuitry, namely, transistors and gates and other devices connected together, so that this input/output chip can handle the lamps.

Here is the equivalent of the little block that is labeled, "Matrix Keyboard," because the switches in this machine are arranged in a keyboard.

Now, it's not like a normal keyboard, because in a pinball game switches may close simultaneously. So we have diodes all over the place, which we would not find in the normal keyboard.

But all of the circuitry here, so that the rows of the switches can be read in, all of these devices on Exhibit 421-B, electronic devices, resistors, et cetera, and so that we can drive the column: None of those are there. And those are there, not because designers like to do things like that. They are there for a purpose.

This is to provide the currents necessary, the right voltage levels, the noise prevention, the noise immunity, and things of this nature.

And none of that kind of detail is present in this diagram.

And on that basis, then certainly this is not -- does not teach a designer how to design a machine

like Williams' Disco Fever.

Q. Does the diagram, Figure 1 show anything about programming the microprocessor?

A. It does not show anything about programming the microcomputer in an application like a pinball game or in this particular case any concurrency or anything of that nature.

Q. Dr. Schoeffler, in your opinion, does this drawing, Figure 1, teach how to interconnect the Motorola 6800 to the pinball machine to make the invention of Claim 45 or any of the other representative claims?

A. I don't believe it does.

We've said time and time again the real key aspects of the pinball game are the things like real time, noise prevention, the matrix multiplexing, the arrangement of all these external electronics.

It clearly is not teaching that. And in an article of this type, it's not intending to teach that.

Q. Now, Dr. Schoeffler, concerning another matter which we discussed on Tuesday, I refer you to PX 419-A through -F, which I believe you testified are the drawings which depicted the electronics of the Cleopatra, which is one of the representative games of defendants Gottlieb and Rockwell.

Dr. Schoeffler, would you point out on the schematics of the Cleopatra where a device involved GPKD

is located.

A. Yes, sir.

Q. Indicate which drawing it's on also, please.

A. Yes, sir.

The drawing is Exhibit 419-D. And on this diagram the chip that we called the general purpose keyboard display chip, GPKD, is this chip right here that is labeled U-6.

Q. What does GPKD mean?

A. Those are the initials of a chip that the vendor supplied with that microcomputer set, so it is part of the family of chips, if we use Motorola's terminology.

Q. This was, you mean this was not a Motorola part?

A. No, no, this is a --

Q. Rockwell?

A. -- this is the, this is the 6502, if I recall. I have to check my notes to be certain on that.

Q. Is it the PBS4/2 by Rockwell?

A. That, that I believe is correct. I'd want to check my notes to be certain, but I believe that is correct; I have seen too many.

Q. One pertaining to 6502 and one pertaining to PBS4/2?

A. That is correct. But the significant point about the GPKD chip is it was part of the microcomputer chip set and it was designed to do two functions which are common in the calculator application of the data for which that chip set was designed, matrix multiplexer display, so two rows, a number of columns of digits, the digital display that we use for scores and the like could be run by this chip, and it is matrix multiplexing in column-to-column; and in addition, the chip is intended to scan the keyboard of the calculator and so provide the readings of the switches into the microcomputer itself.

Q. Was the GPKD device used for this purpose in the Cleopatra pinball game?

A. No, it was not. The device was used partially for display control; namely, the digital displays were driven by the

GPKD chip under control of the microcomputer and its program, communicating with this chip the values of the digits. But it was not possible to use the keyboard scanning portion of the chip. It was specifically designed for the keyboard of a calculator, and as we have indicated, the keyboard of a calculator has different requirements from that of a pinball machine; namely, because you do not expect two switches to be closed at the same time in a calculator, this chip would reject that situation.

As a consequence, it could not handle the pinball situation when two switches would be closed.

And secondly, if a switch ever stuck closed, then there would always be one switch closed, and if any other switch ever closed, the whole thing would be ignored, and so if you use the keyboard portion of this GPKD chip, the thing would just hang up, the microprocessor would just stop running because it would never see another switch closure again, because every one would be interpreted as an error. It was not.

So, in fact what was done is a different chip in the microcomputer vendor chip set was used to handle the switches and this is done with all the electronics to drive the rows in the columns, in the same way it was done by Frederiksen in the pinball game; namely, with a matrix of switches driven cyclically and sequentially by a separate chip.

Q So with the GPKD device, if it were connected to a

matrix of keys, if any one switch would be stuck closed, what would that cause?

A. That would cause the system to just stop because no further switch closures can be detected by a chip of that type, at that point, after that occurs.

Q. Now, Dr. Schoeffler, have you had an occasion to review materials concerning work at Atari on solid state pinball machines?

A. Yes, I have.

MR. SCHNAYER: We had started this subject previously, your Honor, and I wanted to get into some other subjects. This concerns the work of some alleged prior inventions the defendants have raised in the patent office, both by Atari and Ramtek. We are asserting that these are attempted failures and as such, are indicators of unobviousness of the invention.

BY MR. SCHNAYER:

Q. Dr. Schoeffler, I show you PX 128, 129, 130, 167 and 451 and ask you what these are.

A. The first four, 128, 129, 130 and 167 are copies of weekly, or of status reports, I don't know that they are all weekly, of work carried on at Cyan Engineering, the research group of Atari Corporation.

Q. And what about PX 451?

A. PX 451 contains selected portions of depositions from a number of individuals concerning the work at Atari, and also some work on pinball games that was done at Ramtek, another California game company.

Q. And have you had an occasion to review these materials?

A. Yes, I have read the sections as listed here.

Q. Based on your review of these materials, what is your understanding of what occurred at Atari concerning the design of solid state pinball machines?

A. All right, in early 1974, Atari, in its research group, which was called Cyan Engineering, started a project to develop an electronically-controlled pinball game. This Cyan Engineering Research Group was separated from the Atari plant in the production facilities. It was up in the mountains in California somewhere. And they carried out this work over the next few years.

In particular, starting in 1974, they, starting in 1974, they produced some paper designs; that is, designs of pinball machines using random logic of various forms, several designs, which they, as far as I know, never built or tested, but then they acquired an electro-mechanical pinball machine called El Toro and took out the electromechanical logic and proceeded to design a micro-processor-based controller for the El Toro machine. And that was the first phase of their effort.

Later in 1974, they started a second effort by acquiring five different electromechanical pinball games, pinball machines called the Delta Queens, which were again electromechanical.

About this time, the first machine, the El Toro, was cannibalized and they moved on to the second

phase, and this was to design a new microcomputer controller for the five Delta Queens.

MR. GOLDENBERG: Your Honor, I object to this line of testimony by this witness, as to what Atari did and when they did it, insofar as this witness is concerned. I don't know where he got his knowledge from. I don't think he's really told the Court. It is, in any case, pure hearsay coming from him.

If the plaintiffs want to prove to any degree the events at Atari, this is not the way to do it. There were depositions taken of those people. There were many, many documents introduced. And if they want the Court to understand and appreciate Atari, it certainly should not come through this witness.

MR. SCHNAYER: Your Honor, Dr. Schoeffler has reviewed designated portions of the transcripts, which are being submitted to the Court and will be part of the record. He has reviewed those and he is going through a preliminary discussion of what happened, and he is going to give opinions based on his understanding of what occurred on the various Atari projects. I think that is perfectly appropriate and proper from an expert.

MR. TONE: It is not offered, your Honor, to prove the truth of what the witness is now saying. It is offered to prove the basis for the opinion he is about to give.

Other evidence will have to prove the truth of the matters.

MR. GOLDENBERG: Your Honor, I think he may be entitled to testify that, "I have studied these documents and so forth, and based on what I have read, that is my view." But I don't think he has any right to get up here and characterize it and attempt this narrative of what happened. That isn't the way for the Court to hear it at all.

THE COURT: Well, the witness would be permitted to sit in court and listen to testimony by the various witnesses. Instead of doing that, he has read their depositions that were taken in this case. What's the difference?

MR. GOLDENBERG: Well, I think there is a substantial difference. By getting -- I don't think you are getting the facts with respect to Atari in any kind of way as presented by the people who were there and did it; namely, the Atari people themselves.

THE COURT: No, except this is the contrary point of view. I suppose they can come in and testify to what they did. But this is the statement of another expert.

MR. GOLDENBERG: He is not giving you an opinion, Judge.

MR. SCHNAYER: He will be. We are laying a foundation.

MR. GOLDENBERG: He is not testifying as an expert

in this testimony you have been hearing for the past few minutes. He is testifying as a narrator, purporting to attempt to convince you that this is what happened at Atari. And I don't think it should be admitted for any purpose.

MR. SCHNAYER: Your Honor, he is merely stating his understanding of what happened. Then he is going to base an opinion on that. And I don't think -- that is obviously a proper approach to that. If he didn't do that, we wouldn't be able to give his opinion. We have to lay the basis for his opinion.

MR. GOLDENBERG: I think, Judge, that this really is wrong. I think he is entitled to give his opinion and then be asked the basis of his opinion.

THE COURT: Are you assuming, Dr. Schoeffler, that, first of all, let me ask you this: Have you read all of these depositions that are contained in Plaintiff's Exhibit 451?

THE WITNESS: Yes, I have. Those are not the complete depositions. Those are selected portions. But I have read all of those, yes, sir.

THE COURT: Now, in telling me what happened at Atari, are you assuming the truth of the testimony in Plaintiff's Exhibit 451?

THE WITNESS: Yes, sir.

THE COURT: This is really in the nature of a

hypothetical question. He is being asked to assume the truth of this material, and then he will give his interpretation of it.

MR. GOLDENBERG: It wasn't put that way, Judge.

THE COURT: Well, ideally it was, and I think the preferable way to do it is the one I just suggested, and on that basis I will permit him to continue.

MR. SCHNAYER: Thank you, your Honor.

BY MR. SCHNAYER:

Q. Would you continue, please?

A. Yes, sir.

As I indicated, the first phase was the El Toro machine, which was to build an electronic controller for what had previously been a standard electromechanical game.

The second phase used the, another standard electromechanical machine, the Delta Queen. There were five of them produced. And electronic controllers were using microprocessors, were built for those five machines.

Finally, a third phase was undertaken and, called, where another electromechanical machine, called the Super Flight was, had the electromechanical logic removed, and a third version of an electronic controller designed for that machine.

All three phases, the El Toro, the Delta Queen, and the Superflight used the same microprocessor, the Intel 4004, which was the same one that was used by Frederiksen.

The circuits of each of the three machines, El Toro, Delta Queen, and Superflight, were different, and none of them were the same as the one that Frederiksen produced.

The work on the Delta Queens and Superflight started late -- sometime in '74, and ended in late '75.

The last phase was conducted by the Atari plant itself, the engineers in the Atari plant, rather than the research group.

My understanding is that they evaluated the Superflight machine, rejected the design, and undertook their own design of a microprocessor-controlled pinball machine.

And that machine eventually was marketed under the name of Atarian. And it's my understanding that was the first commercial machine that was marketed by Atari.

THE COURT: What was the name of the machine?

THE WITNESS: The Atarian.

THE COURT: A-t-a-r--

MR. SCHNAYER: -- i-a-n.

THE COURT: -- i-a-n.

BY MR. SCHNAYER:

Q Dr. Schoeffler, could you please explain your under-

standing of what the El Toro was.

A. Yes, sir.

As I already said, the El Toro was an electromechanical pinball machine where the electromechanical logic was replaced by electronic logic, namely, a microprocessor-controlled system.

All of the electronics needed to drive the game were external to the machine. They were not put in the machine itself. So the electromechanical logic was gutted out of the machine and then external to the machine was the electronics.

And it was -- the microcomputer itself that was used is actually the Intel development system, called the Intellec, an example of which is shown on the stand right here.

MR. SCHNAYER: That's Defendants' Exhibit 13-B, for the record.

BY THE WITNESS:

A. So the Intellec machine and all the electronics then were connected to the El Toro pinball machine by a cable that was external to the machine itself.

BY MR. SCHNAYER:

Q. What is the Intellec development machine?

A. The Intellec development machine is basically the vendor's microcomputer chip set already put together in a

convenient fashion so that you can try out programs in it in a much more convenient fashion than you can after you've built the microcomputer chip set onto a board with read only memory and embedded it into the machine.

But it is the equivalent of the chip set of the vendor.

Q. To your understanding was the El Toro ever made self-contained?

A. It is my understanding that the El Toro was never made self-contained. That is, the electronic control system was never mounted in the cabinets themselves.

Q. To your understanding were any tests ever performed on the El Torowheh it was in its most complete state?

A. Yes, there were tests performed.

Q. Could you please explain.

A. Yes, sir.

In the depositions a number of tests were mentioned. In particular I've noted here that Michael Rogers, who was a junior engineer working on the El Toro project, tested the El Toro with a drill. He actually lifted up the playfield and turned on an electric drill.

And that has the characteristics, because of the spraking motor, to create external noise. And he found that there was erratic operation of the pinball machine, in his words, namely, lamps would turn on at the wrong time and

the wrong lamps; and solenoids, the things that kick the ball out and the like would operate when they should not.

He called it "erratic operation."

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An electronic designer on the project, Steven Mayer, indicated that external noise, when it was around -- applied to the El Toro machine, caused the machine, in his words, "to bomb."

And that was explained in the deposition as the hang-up of the microcomputer.

This is the situation when noise gets into the circuits of the microcomputer itself, and not into the external circuitry of it, but into the microcomputer itself, and causes the microcomputer, for example, to get an illegal address or a bad instruction. And at that point the microcomputer just stops operating suddenly, it cannot continue. And the machine halts.

And that is a catastrophic failure. The hang-up of a CPU. And, of course, it's obviously unsatisfactory for a commercial product to have that kind of catastrophic failure mode.

Q Do you have any understanding why this electric drill was put -- used in this test on the El Toro?

A It was used to generate external noise. Because it's a characteristic of the pinball game environment that it is a high noise environment. We've heard that from many, many people.

And so if it's going to be operated that way, to show that it operates, you should apply some kind of a

noise test.

And so using the electric drill is one way to generate the noise to see if it will still work.

Q. How does that generate electrical noise?

A. Basically there's an electric motor in the drill. And if you've ever looked at it, the part that rotates, there are brushes on a comutator, and it's like a fast-moving switch, and it produces lots of sparks. So it's very much like electrostatic noise.

But it is a good source of external noise in general, in other words, it's commonly used for this purpose, for testing purposes.

Q. Do you have an opinion as to why these tests were performed on the El Toro?

A. As I just indicated, the pinball machine is intended to operate in an environment where there is noise: Other pinball machines right by it, all the other external noise sources we've mentioned.

So it's my oinion that they were trying to see if it would work in that environment.

Q. In your opinion do the results of these tests show that the El Toro would operate practically in a typical pinball environment from an electrical noise standpoint?

A. Clearly the tests show it would not operate satisfactorily in such an environment.

It's intolerable to have erratic operation, especially when it's evident to the player.

And then the catastrophic failure is something that could not be tolerated.

Q. In your opinion what tests must be performed on a pinball machine such as the El Toro to show that it would operate in its intended environment from an electrical noise standpoint?

A. There are two sources of electrical noise that have to be tested for.

One is external noise, noise coming in from the outside environment. And the most severe example of this is electrostatic noise ,the noise we get when we have charge on the body and we touch it, the little lightning-like discharge.

So it must be tested against external noise, if you're going to be certain that your product will operate in that environment.

But equally important is internal noise, especially in the way that we run the pinball game electronics, namely, matrix multiplexing, supplying high pulses of current and the like, it is necessary to determine that the noise we generate ourselves will not cause the system to fail.

And so it's got to be tested in that combination.

Q. When you say "the noise we generate ourselves," do you mean the device itself?

A. I mean the control system that is generated as a consequence of our design.

Q. Now,without actually placing the electronics of the El Toro in the game cabinet, is the operation of the game predictable from a noise standpoint if it were made self-contained?

A. Unfortunately, the state of the art in electronic engineering is such that one cannot predict the effect of noise test. It really has to be tested.

Putting the electronics into the game gives rise to so many variables -- where you put it, how long the lines are, what are they next to -- that one cannot predict what would happen there, on either external noise or internal noise or the combination.

It has to be tested for, in my opinion, in order to determine what would happen.

Q. Dr. Schoeffler, to your understanding was the El Toro susceptible to malfunction upon the occurrence of a stuck closed switch?

A. It is my understanding that it was susceptible to a stuck closed switch.

Michael Rogers and Steven Mayer, and also Greg Cox, the programmer on the machine, all indicated in

their depositions that if any single switch in the entire machine sticks, the machine stops operating and it hangs up.

And so it is very susceptible to essentially catastrophic failure in case of a single stuck switch.

Q. Dr. Schoeffler, in your opinion is this design acceptable for a practical pinball machine?

A. No, sir. We've heard testimony, especially from Frederiksen, to the effect that the kinds of switches that we have in a pinball machine are of the type that we can expect normally switches to stick now and then, and as a consequence we must have some kind of error recovery capability.

It should not be possible for one little switch in the machine somewhere to stick and shut down the operation of the whole system.

Q. Dr. Schoeffler, do you have an understanding as to the condition of the Flicker pinball machine prior to the December 26th, 1974, demonstration of it to employees of Bally Manufacturing Corporation?

A. Yes, sir, I do.

Q. What was the Flicker pinball machine?

A. The Flicker pinball machine is essentially the machine that we see right here in the courtroom and in that form.

Q. On what do you base your understanding of the condition of the Flicker?

A. On the testimony of Frederiksen and on the depositions that I read from Mr. Dan Winter, the president of Milwaukee Coin, Paul Smith, a technician there, and Mr.David Nutting, the other inventor.

Q. I show you Plaintiff's Exhibit PX 455 and ask you what it is.

A. These are the depositions that of Mr. Smith and Mr.Winter that I read.

Q. Do you base your understanding about the operation of the Flicker partially on those portions of deposition transcript?

A. Yes, I do.

Q. Assuming the credibility of this testimony, Dr. Schoeffler, do you have an understanding as to what tests were performed on the Flicker prior to the demonstra-

tion?

A. Yes, sir.

Q. Please explain.

A. First of all, the Flicker was fully self-contained. So when it was tested, it was being tested for internal noise as well as external noise because the electronics were in the place in the cabinet in the backboard, et cetera, as we have shown.

Frederiksen and the others discussed the three major tests that were applied to it, first, for electrostatic noise, which is the one that is most severe. They used what is called a Van Der Graf generator. It was a machine that can produce large discharges or arcs like lightning through the air. They walked around the machine to all the metal parts and discharged sparks against the machine to see if the machine would fail.

Using that, all of the depositions indicated that they could not make the machine fail. So the combination of internal noise and electrostatic noise did not cause the machine to fail in any test indicated in these depositions.

Secondly, Frederiksen described an igniter that he took out of his gas dryer. This is the device that produces a spark to light the natural gas in the dryer. He apparently walked around the machine and used that on the metal parts similar to the Van Der Graf generator with exactly the same results; namely, despite playing with it constantly in this test, they could not make it fail.

So, again, the combination of external and internal noise could not cause the thing to fail.

Then the last test that is mentioned is similar to that applied to the El Toro; that is, they used what they called a dremmel tool, which, again, is a drill with a very noisy sparking motor, and ran the drill around the machine. That is a good source of external noise, and that could not cause the machine to fail either.

Q. Dr. Schoeffler, as a result of these tests, did the game malfunction at all?

A. There was no indication of any malfulction by any of the witnesses in these depositions.

Q. Now, assuming the credibility of his testimony, in your opinion, was the Flicker prior to the December 26, 1974, demonstration tested sufficiently from an electrical noise standpoint to show that it would operate practically in a typical pinball environment?

A. In my opinion, it was.

It was tested for both internal and external noise, and the size of the sparks and so on that they mention applying to it, are at least as severe, if not more severe, than one would expect to find in the typical pinball game arcade or that kind of environment.

Q. Now, Dr. Schoeffler, you testified that the El Toro, to your understanding, would hang up in a non-operative

state if on the occurrence of any stuck closed switch, the disk problems exist with the Flicker as of September 26, 1974, based on the testimony you have read?

A. According to the depositions, no switch should cause the Flicker to hang up.

Now, what was discussed in the depositions was the way the stuck switches are handled in Flicker, and this is done by taking critical switches; namely, where two switches could close simultaneously or where real time response was critical, and they were put in what is called the test line, a single line of switches, which would result then, that if any switch in the machine you consider critical, you could put it in that line. If it failed, it would not affect any other switch in the machine.

Now, obviously, if a switch fails, the machine does not respond to that switch, you have lost that switch; but it does not shut down the machine as a whole.

Frederiksen described in detail in his testimony all of the techniques for handling the stuck switch problem in the switch matrix; namely, he said if you have a switch that is critical, put it in a column by itself, and that spinner thing where the ball went through the little hole, and the switch spins around, because that keeps spinning long after the ball goes away,-- it can close at the same time as other switches. So he put that in a separate column by itself.

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Then he handled the stuck switch problem for the targets in that way we tried to describe whereby if one of them fails, the machine still records the proper score when the other ones are hit, and when the other ones are hit in that column. He indicated then that what you do is you examine the play rules and the characteristics of the switches. If you discover a switch that is critical in any way, you handle it by one of the techniques he mentioned, and there really is no problem because there were several empty columns in the switch array. So he could have taken more switches and put them in the empty switch array.

Q. Dr. Schoeffler, turning now to the second stage of Atari, the Delta Queen pinball machines, would you please explain to your understanding what those machines were based on the testimony that you read, the documents that you reviewed.

A. Yes, sir.

Based on these depositions, it is my understanding that the El Toro was never completed or made self-contained, and the noise problems were never resolved in it. They just went on to the second stage; namely, the five Delta Queen machines, redesigned the control system, same microcomputer, but different control system, circuitry and the like.

One major difference that was noted is

that there is a higher level of lamp multiplexing; that is, more rows in the lamp matrix.

Q. Dr. Schoeffler, to your understanding, were those machines tested?

A. Yes, they were, sir. It was indicated by Mr. Larry Emmons, who was an electronic designer on the Delta Queen project, and Mr. Steve Bristow, who is vice president of engineering, that one of the Delta Queens was put out in a test location in a pizza parlor at some point.

Their deposition went on to indicate that the machine was found to be very susceptible to static noise, especially sparks to the coin door, and it caused the system in their words to latch up, which is equivalent to bombing or the CPU stopping.

Furthermore, when this occurred, according to Mr. Emmons, the lamps actually burned out because they were being multiplexed, and power was applied to them continuously.

So, apparently, the machine that went in to test had the identical problems as the El Toro. They were not solved in the El Toro, and they apparently were not solved in the Delta Queen either.

Q Did it have any problems with stuck switches?

A Yes, it did. Mr. Bristow, the vice president of engineering, in his deposition, said that the machine in the pizza parlor did have the stuck switch problem, and in particular, he indicated that it couldn't be handled. In fact, in the, his memo, one of the exhibits here, the one that is labeled Plaintiff's Exhibit 130, which is his weekly status report for the week of March 14th, 1975, he has a brief paragraph reporting on the status of the pinball project and the statement reads: "The software cannot cope with stuck switches so everything bombs when this happens. This often leaves the machine in an unplayable state." That was on March 14th.

Q That was Exhibit PX-130?

A That is correct. And in a previous report, from February 7th, in his report on the pinball, he makes a statement: "We also had a stuck switch problem which put the machine out. Superflight, however, will be tolerant of stuck switches, we hope."

Superflight is the next stage beyond the Delta Queens and presumably they intend to solve the stuck switch problems in the next phase.

Q And what years are these documents dated, Dr. Schoeffler, 130 and 129?

A Both documents are dated 1975; one February 7th and one Hardh 14th.

Q. Now, referring to PX-130, under the section "Pinballs," could you please read the first sentence?

A. PX-130, yes, sir.

Q. Read it aloud, please. Let's say the first couple sentences.

A. This is his report on the pinball project. There are other projects being reported on. He says:

> "Software 80 percent checked out. PC board 90 percent laid out. We pulled our Delta Queen off location this week and have conducted an autopsy. The machine has two inherent faults that make it unsuitable for location. The power on reset circuitry is unsatisfactory. Brief half-second power outages where kids playing with the on-off switch can send the machine in the non-scanning states or spurious game count."

And then the next sentence that I previously read, namely, the software can't cope with the stuck switches, follows that.

Q. And was this also a problem that the El Toro had, the stuck switch problem?

A. Yes, it is my understanding that the catastrophic failure of the machine, either from a noise source or from the stuck switch problem, is the same problem that was in the El Toro.

Q Now, Dr. Schoeffler, based on the results of this test, did you come to any conclusion as to whether the design of the Delta Queen was shown to be operable practically in a typical pinball environment?

A. Well, based on these depositions and the test in the pizza parlor, it clearly is no more satisfactory for operation anywhere than was Delta Queen. The only difference seemed to be that it was enclosed rather than the electronics external.

Q. Dr. Schoeffler, referring now to the third stage of Cyan Engineering, the Superflight pinball machine, will you explain to us your understanding of what that machine was, based on the testimony?

A. Superflight again was a third electromechanical pinball game with the electromechanical logic removed and a third version of the electronic control system designed, built and put inside the machine. It was a fully-contained machine as was Delta Queen. And as I indicated, it used the same microprocessor as the previous two, the 4004; the circuitry was different from the previous two. There were changes in hardware and software, apparently. And the design was not the same as Frederiksen used in his Flicker machine.

Q. And this was designed by what group at Atari?

A. This was designed by the Cyan group. This was still part of the engineering research group at Cyan.

Q. Were there problems with the operation of the Superflight?

A. Yes, there were. In particular, a Mr. Robert Jonesi, who is a game designer, testified that there were, there was erratic operation and switching problems in the machine.

Q. Did the Atari engineers use the Cyan design in the first coin-operated games sold by Atari?

A. They did not. Mr. Steve Mayer and Steve Bristow, in their depositions, indicated that Atari chose not to use the

Superflight, but, rather, to design their own, and that finally appeared in 1977, and that is the one I mentioned was called Atarian.

Q. Dr. Schoeffler, was Mr. Jonesi an employee of Atari at that time?

A. Mr. Jonesi at the time of the deposition?

Q. No, no, excuse me, at the time that he was talking about the operation of the Williams Superflight.

A. Yes, he was. Yes, he was. He had been with Ramtec and then moved to Atari, is my recollection.

Q. Now, Dr. Schoeffler, I am going to show you a copy of Plaintiff's Exhibit 432 and ask you what it is.

A. This is the service manual for the Atarian pinball game that I looked at in examining the Atari game.

Q. Do you have an understnading of the operation and construction of the Atari Atarian pinball machine?

A. Only a portion of the game.

Q. What do you base your understanding on?

A. A study of the service manual and the schematics, the circuit diagrams in this manual.

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Q. Dr. Schoeffler, have you done an analysis to determine whether Claims 45 or 95 read on the Atari Atarian pinball machine?

A. Yes, I have.

Q. What portion of the --

THE COURT: Now, the Atari is something different from Super Flight?

THE WITNESS: Yes, the sequence went El Toro, Delta Queen, Super Flight, which was carried out by the research group. And then the engineers abandoned that and designed their own, and there is a commercial game.

THE COURT: I see.

BY MR. SCHNAYER:

Q. What portion of the manual did you look at -- what did you look at in the manual and what portion of the circuitry did you determine the operation of?

A. I concentrated mainly on the scanning of the switches.

Q. Now, Dr. Schoeffler, I show you a document which has been labeled Plaintiff's Exhibit 403 and ask you what it is. And it is this enlarged drawing here.

A. This is a diagram that represents my understanding of the way the switches are scanned in the Atarian pinball game that I drew, and this was prepared under my direction.

Q. Now, would you please explain to me your conclusion as to whether the Atarian actually was covered by Claim 45

and 95? What other claims read on the Atarian?

A. I concluded that neither claim reads on the Atarian pinball game.

Q. What is the reason for this?

A. The reason is that both claims require matrix multiplexing of the switches, and the switches in the Atarian pinball game are not matrix multiplexed in my opinion.

Q. Using this drawing, PX 403, would you explain why Claims 45 and 95 do not read on the Atarian?

A. Yes, sir. On this exhibit, PX 403, I have drawn an over-simplified block diagram of the system to simply show the way the switches are interconnected into the system, ignoring other electronics in the system.

Here is the microcomputer; the individual switches in the system are shown here at the right. As I recall, there were as many as 80 of those. And there are a number of devices called decoders which are standard little electronic chip devices.

In order to read or sense the status of a switch, the microcomputer sends out from itself, along its buses, the number of the switch. And that information in part goes to a decoder. And the function of the decoder is to look at the number that the computer sends it and if it was, if it is equivalent to the number 8, for example, it would select the number 8 decoder in this line. If it

was the number 3, it would select the third decoder, et cetera.

The remainder of the information from the computer is sent to those decoders and it selects which of the switches on the selected decoder is, has its one side connected to ground. And if we have selected, for example, this switch then, by sending the appropriate data out, then we have a path for that switch through this circuitry right here into a single input line in the computer.

And so the process of determining the status of a switch is to pick the switch whose value you want to know -- is it open or closed -- the decoders select that one switch, and then you read its value in here.

Now, when the switches are connected this way, they are not a matrix, that is, there is no column of switches, there is no row of switches, and the enabling of the switches in the normal switch matrix. And they're read one at a time in response to selection of the switch number from the microcomputer itself.

As a consequence, I found no matrix in the machine and no matrix multiplexing, I concluded that claims 45 and 95 do not read on the Atarian machine.

Q. And that's a matrix of switches.

A. I'm sorry.

Q. That's a matrix of switches? You said you found --

A. That is not a matrix of switches, I did not find a matrix of switches or matrix multiplexing in the machine.

Q. Thank you.

Dr. Schoeffler, in your opinion would the noise problem and stuck switch problems on the El Toro have been routinely solvable by a person of ordinary skill in the digital logic art in the 1974 time frame?

A. In my opinion they would not have been routinely solved by the average person in the digital logic art in that era

for a number of reasons that I've already mentioned. I'll just summarize quickly some of those.

One is, the typical engineer in the random logic art was not accustomed to the catostrophic kinds of problems that noise caused to a microcomputer chip, namely, in a random logic design, if no external or internal noise gets into the portion of the system, a light may light or a solenoid may close, but the system doesn't catastrophically fail normally.

Whereas, if you allow it to get into the microcomputer itself, into the CPU and its bus, you get this bombing or hang-up that was mentioned for all three of the Atari machines, the El Toros, Delta Queen, and the Super Flite.

Secondly, the second major difference is, the random logic designers were not accustomed to solving problems in software. That is, they were -- they were accustomed to hardware design.

But when you bring the microcomputer into the picture you are now asking that engineer, who had not worked with software and programming, to make tradeoffs: What should I do in hardware and what do I do in software.

This is what Dr. Vacroux referred to very aptly as the systems approach. You've got to look at the whole application, the whole pinball machine, and make these

judgments. And it takes a lot of know-how and experience to do that.

And they just did not have, in this period, that kind of experience.

In fact, in the deposition of Steven Mayer, he says -- and I copied the quote: "Cyan engineers did not realize the sophistication of electronic pinball machines."

And another quote that is appropriate from Larry Emmons in these depositions, namely, that: "There was a lack of knowledge of micros and programming."

And that appears evident in the results. Namely, that the problems were there and observed in the El Toro; they were expected to be solved in the Delta Queen; they were still there in the Delta Queen; they were expected to be solved in the Super Flight; and there were still problems with the Super Flight.

And so that indicates to me that the problems were not obvious to solve, because otherwise someone would have solved them just to get rid of them.

THE COURT: I think what we'll do is recess now until 2 o'clock.

MR. SCHNAYER: Thank you, your Honor.

(Recess at 12:50 p.m., to 2:00 p.m., of the same day.)

nd am

BALLY MANUFACTURING CORPORATION, a Delaware corporation,

Plaintiff/Counterdefendant,

vs.

D. GOTTLIEB & CO., a corporation, WILLIAMS ELECTRONICS, INC., a corporation, and ROCKWELL INTERNATIONAL CORPORATION,

Defendants/Counterplaintiffs.

Docket No. 78 C 2246

Chicago, Illinois
January 26, 1984
2:20 p.m.

VOLUME X-B
TRANSCRIPT OF PROCEEDINGS
BEFORE THE HONORABLE JOHN F. GRADY, JUDGE

TRANSCRIPT ORDERED BY: MR. JEROLD B. SCHNAYER
MR. MELVIN M. GOLDENBERG

APPEARANCES:

For the Plaintiff/
Counterdefendant:

MR. KATZ
MR. SCHNAYER
MR. TONE
MS. SIGEL

For the Defendants/
Counterplaintiffs:

MR. LYNCH
MR. HARDING
MR. LEACH
MR. GOLDENBERG
MR. ELLIOTT
MR. RIFKIN
MR. GOTTLIEB

Court Reporter:

LAURA M. BRENNAN
219 South Dearborn Street, Room 1918
Chicago, Illinois 60604

(The following proceedings were had in open Court.)

THE CLERK: Bally v. Gottlieb, case on trial.

JAMES SCHOEFFLER, PLAINTIFF'S WITNESS, PREVIOUSLY SWORN.

DIRECT EXAMINATION (Continued)

BY MR. SCHNAYER:

Q. Dr. Schoeffler, what microprocessor did the Atarian use as shown in the manual, PX-432?

A. The Atarian commercial game from Atari used a Motorola 6800 microprocessor.

Q. Is that the same microprocessor used by Williams in the Flash Disco Fever?

A. That is correct.

Q. Just to make sure I covered this prior to lunch, referring to the Atari Atarian pinball machine, one, which Steven Bristow testified was first sold in January 1977, and, two, which you concluded that the representative claims read on, did the Atarian use the same or a different electronic system that was used in the El Toro, Delta Queen, and Super Flite pinball machines?

A. The Atarians used a different electronic system in the scanning of the switches.

Q. Now, Dr. Schoeffler, will you please describe your understanding of what work was done at -- excuse me. I withdraw the question.

Do you have an understanding as to work that

was done at Ramtek on a solid state pinball machine?

A. Yes, sir. I do.

Q. What do you base that understanding on?

A. The reading of the depositions that we previously discussed in this exhibit 451.

Q. Based on that testimony and assuming that the testimony is credible, in your opinion, in its most complete state was the Ramtek Lucky Dice shown to be operable as a practical pinball machine in its intended environment?

Let me first ask you to describe the Lucky Dice pinball machine.

A. Yes, sir. The Lucky Dice pinball game designed by Ramtek was not a reconverted electromechanical pinball machine as were the ones by Cyan Research Division of Atari. Instead, it was designed from scratch, and all of the electronics that were used to control the game were mounted in what they called a cage, which is sort of an enclosure, and it was not integrated into the pinball game itself. It was external to the pinball game and connected to the pinball game via a cord.

The game used the 4004 microprocessor, Intel microprocessor, just as did Flicker and just as did all the Cyan Engineering machines. But the circuitry was different and not the same as that used by Frederiksen.

My understanding from the depositions was that the project started in late 1974 and was abandoned before completion in 1975.

Q. Dr. Schoeffler, in your opinion, in its most complete state was the Lucky Dice shown to be operable as a practical pinball machine in its intended environment?

A. My understanding is that it was -- it was -- it was not tested and shown to be operable in its intended environment.

Q. Could you please explain.

A. Yes, sir.

The depositions by Mr. Jonesi, the same man we referred to earlier, at this stage was working for Ramtek, and Howell Ivy, who was a hardware designer, testified that it was -- the machine was not self-contained, was never made self-contained, that is, the electronics were not put into the pinball machine, and it was never fully tested as a consequence.

Mr. Chuck McKeown, in his deposition, testified that the one time they tried to integrate the machine, that erratic operation resulted, and they did not continue -- continue the test.

Q. Who was Chuck McKeown, to your understanding?

A. McKeown... he was the president of Ramtek. He was the president of Ramtek, yes.

Q. Okay. Continue, please.

A. And then there was other comments by Mr. Jonesi, again, and specifically he said that the machine, the Lucky Dice machine, could not be produced as a product or even put out in a test location because of the erratic operation.

He indicated, for example, that the operation was too erratic to allow the game to be played repetitively, to do what is called percentaging.

That is, after a game is designed, you apparently play it enough times so that you can determine what bonuses to give a player so that the average player will play for at least a minimum length of time to get his money's worth, but not too long a time.

And he indicated that machine was too erratic to even carry out that percentaging.

Q. What was Mr. Jonesi's function in that Lucky Dice pinball machine?

THE COURT: I'm sorry, I didn't get the --

BY MR. SCHNAYER:

Q. What was Mr. Jonesi's -- what part did he have in that project at Ramtek, the design of the Lucky Dice pinball machine?

A. My understanding that he is a game designer, that is, the playfield of the games.

Q. Now, Dr. Schoeffler, previously you testified about first generation of microprocessors that had come out, and then a second generation.

And I'm going to ask you a question directed to that second generation: Even when the second generation of microprocessors became available, would this have solved the problems of using a microprocessor in a pinball machine?

A. The newer microprocessors that came out, the so-called second generation microprocessor machines, like the Motorola 6800 and others, were certainly faster than the Intel 4004 that was used by Frederiksen.

And because of the chips that went with them, the so-called family of chips, it was a more economical one to use.

However, the problems in the design of the pinball game are not necessarily due only to the speed of the microprocessor.

As we've indicated, the problems are related to things such as electrostatic noise and stuck switches which have little to do with the speed of the microprocessor and the like.

It is necessary to be able to understand the problems of the pinball game, what they are, and play off

alternatives in hardware and software to solve them. And it's necessary to be able to do real time programming.

And these concepts are the same whether you're using the slower 4004, that first microprocessor Frederiksen and everyone else used in the early days, or one of the later ones.

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Q. And that 404 was used by Atari at the Cyan engineering Atari project, is that correct?

A. That's correct.

Q. And that same microprocessor was used by Ramtek in the Lucky Dice game, isn't that correct?

A. That's correct.

MR. SCHNAYER: Your Honor, may I have just a minute?

(Brief pause.)

MR. SCHNAYER: Your Honor, we would like to offer into the record, into evidence, certain exhibits. I have copies for the Court of some of the larger schematics.

THE COURT: I have enough up here, I think.

MR. SCHNAYER: That's fine. Let me read these. And I think some of them we have already offered, but:

PX-3-A, 128, 129, 130, 167, 330, 331, 385, 386, 387, 388, 389, 390, 394, 395, 396, 397, 399, 400, 401, 403, 404-A, 404-B, 405, 406, 411-A, 411-B, 412-A, 412-B, 412-C, 416-A through -R inclusive, 420, 420-A, 420-B, 420-C, and 420-D. That's subject with the connection that's the freedom manual and schematics.

425, 430, subject to connection. That was the manual of the Atarian.

432 -- excuse me, -- 430 was the manual of the Bally games. 432 is the Atari game.

436, 449, 451, 452, 453, 454, 455, 459, 460

and 461.

THE COURT: All right. Those are all received over all objections that were made at the time.

MR. LYNCH: And subject, your Honor, to us placing the counter designations, that's my only other.

THE COURT: Yes.

(Said documents, marked Plaintiff's Exhibit Nos. 3-A, 128 through 130, 167, 330, 331, 385 through 390, 394 through 397, 399 through 401, 403, 404-A, 404-B, 405, 406, 411-A, 411-B, 412-A through 412-C, 416-A through 416-R, 420, 420-A through 420-D, 425, 430, 432, 436, 449, 451 through 455, 459 through 460, were received in evidence.)

MR. SCHNAYER: 416 is also one of the exhibits. It was the notebook itself. And 416-A through -R were particular exhibits in the notebook, but just to make sure, we offer 416 also.

Thank you, your Honor.

(Said document, marked Plaintiff's Exhibit No. 416 for identification, was received in evidence.)

THE COURT: Does that complete the direct examination?

MR. SCHNAYER: That concludes the direct examination, thank you, your Honor.

MR. LYNCH: May it please the Court, your Honor.

THE COURT: Mr. Lynch.

CROSS EXAMINATION

BY MR. LYNCH:

Q. Dr. Schoeffler, just so we can put in perspective what you just testified about, you just testified about a number of Atari games, right?

A. Yes, sir.

Q. First one you testified about was the Atarian?

A. That was the last one.

Q. Well, let's take them in inverse order.

A. Yes, sir.

Q. And that Atarian game, you said, had a different system than claims 45 and 46, right?

A. It had a different system from multiplexing, or for reading the scanning to switches, that is correct. It did not do matrix multiplexing of the switches.

Q. It did not do matrix multiplexing of the switches?

A. That is correct.

Q. It did multiplex the switches, though, didn't it?

A. In the general sense of the word "multiplexing"; namely, a connection, it did connect the switches in one at a time, that is correct.

Q. And multiplexed them in a time division multiplexing fashion, correct?

A. The connection of the switches into the microcomputer timeshared the channel, that single channel that I drew on the bottom of the diagram into the computer.

Q. That's time division multiplexing, correct?

A. One can use that word to describe it, that is correct.

Q. So, the switches were multiplexed. Sequentially and cyclically were the, sequentially and cyclically were the switches in the Atari multiplexed?

A. Not in the sense of the words "cyclically and sequentially, as defined in the specification, to my understanding, where, where that, that set of words was used to indicate the enabling of columns in the matrix; these switches are not in a matrix and so it is not --

Q. I understand.

A. So they are not cyclically and sequentially scanned, to my understanding, the way it is described in the specification.

Q. Well, let me ask you this: We saw the lamps that Mr. Frederiksen laid out here, correct? You saw that little demonstration of Mr. Frederiksen's lamps?

A. I wasn't in Court when he testified.

Q. You must have seen the exhibit though?

A. I have seen the exhibit, yes, sir.

Q. And in that exhibit, when you turned the resistor one way, this lamp lit then the next lamp, and it went through a cycle, correct?

A. That is correct.

Q. And they were lit cyclically and sequentially, isn't that correct?

A. They were lit cyclically and sequentially; I don't know how the circuit actually in that exhibit was organized. It is true that the lamps were enabled.

Q. Cyclically?

A. Sequentially.

Q. And cyclically and sequentially, isn't that right?

A. It is right.

Q. And in the same fashion, the switches in the Atarian were multiplexed cyclically and sequentially, correct?

A. In the same fashion, meaning that one switch at a time was addressed just as Frederiksen in his exhibit or demonstration addressed one of the lamps at a time, yes.

Q. And went in a cycle and repeated the cycle, correct?

A. That is correct.

Q. So, Atarian switches were multiplexed cyclically and sequentially.

Now, the Atarian. How were the displays handled?

A. I did not examine the whole Atarian machine.

Q. Did you examine the entire Atarian brochure or manual?

A. I looked through it, and my primary interest was in determining whether the switches were matrix multiplexed,

because that's the requirement for infringement. And when I discovered they were not matrix multiplexed, I did not continue the study, so I don't know how the digits are read.

Q. The switches being multiplexed is the requirement for infringement; is that your position?

A. The switches must be matrix multiplexed. They must be connected in a matrix, in claims, in the claims.

Q. Claim 45 we are talking about?

A. Yes, sir.

Q. Now, if I show you page 27 of the Atarian brochure and I ask you if you can determine from a reading of it whether or not the displays in the Atarian were matrix multiplexed, matrix multiplexed --

A. May I read this now?

Q. Yes. Is this the first time you have ever seen that part of it?

A. I may have seen it, but I did not study it.

Q. Well, perhaps -- well, I will let you do that during a break, Doctor. There is no need to take the Court's time now. But I will bring it back to you later.

Let's go on then to the next, these are the Atari efforts, can I call them that on this chart? And we are going to take them in reverse time order, okay?

A. Yes, sir.

Q. The last one was the Atarian. And we will leave some

space for how the displays were handled. The one before that was Super Flite, correct?

A. That is correct.

Q. Now, Super Flite was a pinball game. Were the switches multiplexed cyclically and sequentially in Super Flite?

A. The portions of the depositions that I read did not detail the operations of the previous three efforts of Atari: The Super Flite, the Delta Queen and the El Toro, in their circuit organizations.

Q. So you don't know whether Super Flite, Delta Queen and El Toro used matrix multiplexing?

A. I did not study the schematics or any of the, any information whatsoever about the organization of those circuits to determine that, that is correct.

Q. So the only thing that you studied were the depositions in order to determine these flaws you testified about in their operation, is that correct?

A. That is correct, the effects of noise and stuck switches, the error recovery and the noise problems.

Q. But you didn't look at the circuitry of the devices themselves to investigate how they attempted to attack the problem, as you have said it, of a microprocessor-controlled pinball machine?

A. That is correct.

MR. LYNCH: For purposes of identification, your Honor, I would like to mark the chart that I have just begun, entitled "Atari Efforts," as Defendants' Exhibit 19-C.

BY MR. LYNCH:

Q. Let's return then, Dr. Schoeffler, if I may: In your direct examination the Court asked you what the invention was in this case. Do you recall that?

A. Yes, sir.

Q. I made up from your testimony what I believe is an accurate reflection of what your testimony indicated at that point, and I'm placing it before you.

You can have reference to the transcript at page 1291, as indicated in the upper corner.

MR. SCHNAYER: John, do we have a copy of that?

MR. LYNCH: No.

MR. SCHNAYER: Could I ask that you provide us with copies?

MR. LYNCH: I will.

MR. SCHNAYER: Please.

BY MR. LYNCH:

Q. The invention is: "A microprocessor controlled pinball machine applying matrix multiplexing to provide a real time response and error recovery capability in the noisy environment of a pinball machine, carrying the connotation of noise prevention and noise immunity."

Is that what it is?

A. I should have qualified the "applying matrix multiplexing to the switches and some of the displays."

Q. "...to the switches and some of the displays."

So you would add here, "to the switches and some of the displays."

Is it now, Dr. Schoeffler, is it now an accurate representation of your view of the invention?

A. Yes, sir.

Q. All right. Now let's refer -- do you have a copy of the patent before you, Dr. Schoeffler?

A. I have the notes that I used in testifying, if I could refer to those.

Q. Well, let me just give you a copy of the patent, if I may.

A. Okay.

Q. And ask you to refer to that.

A. Um-hmm.

Q. The '441 patent that we're dealing with here, then, and specifically you dealt with Claims 45 and 46 and 95 and some other dependent claims, correct?

Well, I'd like to take this first condition of matrix multiplexing --

A. Um-hmm.

Q. -- and ask you whether that condition or that particular

limitation is found in Claim 45 expressly.

(A brief interruption.)

BY MR. LYNCH:

Q. Matrix multiplexing, does that appear in Claim 45?

A. That appears in the sense that in order to understand Claim 45 I went to the specification to see what was meant by "multiplexing means."

And what I found in the specification was matrix multiplexing.

And so it is in Claim 45, as I understand the interpretation of claims.

Q. But it is true that it's not expressly in Claim 45. Correct?

A. The word "matrix" is not in Claim 45.

Q. Or matrix multiplexing as such.

A. The word "multiplexing means," however, appears in Claim 45, and it's my understanding that that definition is equivalent to what the specification says.

Q. Now, that's your understanding. Isn't that correct?

A. That's correct.

Q. And what you're saying is that matrix multiplexing is implied in Claim 45 in view of the specification. Correct?

A. I wouldn't use the word "implied" --

Q. Well, you are implying its existence, correct?

A. No, sir. What I am saying is when it says multiplexing means, that I went to the specification and read it carefully to see what was disclosed, et cetera, and matrix multiplexing is disclosed. So that is the meaning of the word, multiplexing means, and I would not use the word, implication.

Q. It does say the switches are multiplexed -- or various things including the switches are multiplexed cyclically and sequentially. It does say that in Claim 45, isn't that correct?

A. It does say multiplexing means cyclically and sequentially enabling.

Q. Correct.

So it does use the word, multiplexed. It uses the word, cyclically, and it uses the word, sequentially, correct?

A. It uses the words in not exactly the same sequence.

Q. Correct.

Q. Now, would you be satisfied if I would say it is not express -- matrix is not expressed in Claim 45?

A. No, sir. My understanding of how to read Claim 45 was to go to the specification to see what was disclosed. When I found that matrix multiplexing is the only multiplexing disclosed in the entire specification, then I equated that to multiplexing means.

Q. Fine.

Let's assume you only had the claim, only the claim.

Under those circumstances, the claim does not say matrix multiplexing, correct?

A. The claim does not use the word, matrix.

Q. So it does not say expressly matrix multiplexing?

The claim does not expressly say matrix multiplexing?

A. I am not certain I understand your question, sir, whether you mean in a legal sense that I --

Q. I do not mean in a legal sense.

Engineer to engineer, does it say matrix multiplexing, Dr. Schoeffler?

A. It does not use the word, multiplexing. -- I am sorry-- matrix.

It uses the word, multiplexing, and from an engineering terminology point of view, that is such a broad term that I would not be able to interpret it.

Q. It could mean what is done in the Atarian, right?

A. The word, multiplexing, if read out of context of the specification could mean many different forms of multiplexing of various kinds including that one.

Q. So let's just say it is not expressed in the claim.

Matrix multiplexing -- I will put quotes over

it -- is not expressly recited in the Claim 45, correct?

A. I don't agree with that as I understand how to read a claim.

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Q. Let's go to Claim 46.

Now, what does Claim 46 say?

A. Claim 46 says, quote:

"The game of Claim 45 wherein the signaling means associated with the respective response means and the display activation means associated with the respective display means are operatively connected as a plurality of sets of elements in a matrix, the multiplexing means having means for cyclically and sequentially enabling each set of elements of the matrix."

Q. What does Claim 46 say about matrix multiplexing, Dr. Schoeffler?

A. Claim 46 says that in order for it to read on a device, there must be at least one matrix in the device that is matrix multiplexed and which contains both switches and some displays.

Q. So there we can say matrix multiplexing is expressly recited in the claim. You will agree with me there?

A. Matrix multiplexing is specifically recited in Claim 46.

Q. Expressly recited?

THE COURT: I think Dr. Schoeffler is wary of some hidden trap in the word, express. Is there one?

MR. LYNCH: There is not, your Honor.

THE COURT: If there is not, you can save a lot of time.

MR. LYNCH: There is not, your Honor.

THE COURT: All right. I understand what he is saying. I think you understand what he is saying. Let's not quibble over a word.

MR. LYNCH: Fine.

BY MR. LYNCH:

Q. Let's go to Claim 2.

A. To which?

Q. Claim 2.

A. 2.

MR. SCHNAYER: Your Honor, I object to referring to any of the claims which aren't the representative claims which we have indicated. There are 10 representative claims. We were required to do that. We did not go into these on our direct examination. This is beyond the scope of direct.

We specifically limited it to that. If your Honor remembered, they were required to limit the references that they cited, and we were required to limit our claims. We even limited it down further to six.

This will really lengthen the time that we are going to have to redirect on Dr. Schoeffler. We have never addressed those. Those are not in issue in this case.

MR. LYNCH: Your Honor, several things: A, in order to get the perspective on this patent, one has to look at some of the other claims; B, there is a declaratory judgment action

that is pending against this patent; and, C, I gave notice that I was going to refer to other claims when this case began.

In order to properly construe this patent, we have to just take a look at some other short claims.

MR. SCHNAYER: Your Honor --

MR. LYNCH: Now, the witness has been speaking about this patent, testifying about claim construction and things of that nature. I think I am entitled to pursue this, your Honor.

MR. SCHNAYER: Your Honor, he has not even gone into these other claims. We have not addressed those claims with Dr. Schoeffler because they are not in issue.

THE COURT: I understand that.

MR. KATZ: There are 95 claims.

MR. SCHNAYER: There are 95 claims in this case.

THE COURT: The scope of cross-examination is broad enough to include anything that tests what was said on direct examination. If something in one of these other claims throws light on the direct examination, it is within the scope of cross.

I will overrule the objection.

BY MR. LYNCH:

Q. Now, I have made a column here, claims in suit. Claim 45 is a claim in suit. I am going to make another column, claims not in suit.

Dr. Schoeffler, Claim 2 is one of those, as counsel has just indicated.

Now, what does Claim 2 indicate about whether or not there is a matrix multiplexing?

A. Well, I have to go back first to Claim 1 because Claim 2

starts out saying, "The apparatus of Claim 1."

May I read Claim 1?

MR. LYNCH: Surely.

(Brief interruption.)

THE WITNESS: All right.

BY MR. LYNCH:

Q. Now, Claim 2, does it mention matrix multiplexing using the word, matrix?

A. In Claim 2 -- the wording of Claim 2 exclusive of the preamble; that is, the apparatus of Claim 1 uses the word matrix.

Q. But what is arranged in the matrix and is multiplexed in Claim 2?

A. In Claim 2 -- let's go back to Claim 1. May I?

Q. Sure.

Isn't it sufficient to look at Claim 2 and see what is in the matrix in Claim 2?

A. All right. Claim 1 calls for matrix multiplexing of the signaling means and matrix multiplexing of the display activation means.

Q. Now, the word, matrix, does not appear in Claim 1?

A. The word, matrix, per se does not appear in Claim 1, but as I said earlier, in understanding the meaning of that claim; namely, the word, multiplexing, okay, multiplexing is equated to matrix multiplexing throughout the specification. So I

use them synonymously.

Q. Okay, you use them synonymously.

A. Yes, sir.

Q. Now, tell me what Claim 2 adds to Claim 1.

Isn't it the case, Dr. Schoeffler, that Claim 2 indicates where the signaling means or the switches are located as sets of elements in the matrix?

MR. SCHNAYER: Objection, your Honor. The witness was reading the patent trying to answer the last question, and Mr. Lynch cut him off asking another question.

THE COURT: Well, we want to give the witness time to answer. So let's put this second question on hold for a minute.

MR. LYNCH: It's the same question, your Honor. I was trying to lead him.

BY THE WITNESS:

A. (Reading patent.)

As I read and understand Claim 2, it is simply specifying a specific structure, namely, the matrix; whereas Claim 1 is using the means and function language.

BY MR. LYNCH:

Q. But Claim 2 says "the switches shall be in a matrix" expressly. Correct?

A. That's what I meant by the word specific structure.

Q. 2 says "the switches in a matrix," expressly. Correct?

A. That is correct.

Q. Claim 1, then, does not say it expressly. Correct?

A. Claim 1 uses the word multiplexing means, which requires one to go back to the specification to determine that it is matrix multiplexing, that is correct.

Q. Now, Claim 3 -- take a look at Claim 3, and tell me what that adds to Claim 1.

A. (Witness reading patent.)

As I read and understand Claim 3, it is a specific statement of the structure rather than the means and

function language of Claim 1. So it says that the display means are specifically in a matrix.

Q. So it says the displays are in a matrix expressly. Correct?

A. That is correct.

Q. Now one more claim, Dr. Schoeffler. Look at Claim 7.

A. Claim -- sorry?

Q. 7.

A. (Witness reading patent.)

Claim 7 is saying that the -- there must be at least a single matrix in which both signaling means and display means are connected.

Q. It says -- we have 2 saying switches in a matrix expressly; 3 saying displays in a matrix expressly; and Claim 7 saying switches and displays in a matrix expressly. Correct?

A. Not quite.

7 says there must be at least one matrix containing both switches and displays.

Q. In the same matrix.

A. Switches and -- there may be more than one matrix, but in at least one of the matrices you must find some switches and some displays.

Q. In a matrix -- let me just say "in one matrix," or in one of the --

A. "...one of the...."

Q. -- one of the matrix -- one of the matrices.

So I've modified this Claim 7 to say: "Switches and displays in one of the matrices." Correct?

A. That is correct.

Q. Now, then, structurally, as an engineer, is there any difference between Claim 2, where the switches are said to be in a matrix expressly, and Claim 1, insofar as structure of a device could be concerned?

A. My understanding of the difference between Claim 2 and Claim 1 is the specific structure versus the means plus function language.

Q. But you're reading the means plus function language to mean that very specific structure, correct?

A. I'm using the means plus function language in Claim 1 to mean that there may be one or more matrices, that the switches may be in a matrix, the lamps, displays may be in a matrix, or they may be in the same matrix, or any combination thereof.

Q. Yes. But according to Claim 2, the only thing that has to be in a matrix are the switches.

A. That's not my understanding of Claim 2 because it includes Claim 1. And Claim 1 calls for both switches to be in a matrix and displays to be in a matrix, whether the same matrix or multiple matrices. And Claim 2 includes Claim 1.

Q. So what you are saying then, Dr. Schoeffler, is effectively Claims 2 and 3 do not alter the scope or content of Claim 1; isn't that correct?

A. No, sir, I have to use the words that I was taught about in reading the claims; namely, it gives the specific structure in contrast to the means language.

Q. But you're reading the means languages to mean that very structure specified in Claim 2 and Claim 3, correct?

A. That is correct.

Q. Let's move on then, Doctor. Let's move on to claim -- to the real time.

Now, let me just understand something. Your definition of the invention was applying matrix multiplexing to the switches and some displays?

A. That is correct.

Q. Must they be in the same matrix?

A. No, sir.

Q. Now let's go to the second requirement in your definition, real time. Are the words "real time," do they appear in any of the claims of the patent in suit?

A. Literally?

Q. Literally.

A. They do not appear, they do not appear literally.

Q. Is there any indication in any of the language of the claims of the patent in suit that a device has to respond in

real time?

A. Yes, sir, the word "operative" is used consistently in the claims that I studied, and "operatively" is defined by the specification, clearly indicates real time.

Q. Now, real time exists in several contexts in a pinball game, doesn't it, Dr. Schoeffler? You have to respond in a certain period of time, correct?

A. The definition of real time is responding in time to affect the environment, so there are multiple situations in which you have to do that in a pinball game, yes.

Q. Now, one you indicated was the displays.

A. That is correct.

Q. Now, you said you have to light the displays in order that the person sees the displays and associates it with a ball hitting something, correct?

A. That is correct. The game rules call for targets to be lit when they are hit and if one were to light the target too much later than when the ball hits it, the player would get a very odd feeling of the response of the game.

Q. Now, do calculators operate in real time in the context of the displays?

A. Not in the way I used real time.

Q. Well, I have a calculator here. I push nine and I see a nine. Is that not a real time response?

A. It is a response. To be what I would call a real time system with a real time constraint, you would have to associate with that some kind of a response time, such as we do, for example, when a ball hits a target and, say, that we should respond in milliseconds.

Q. Ah, so --

A. In the case of the calculator, when you press the button or you perform a calculation, the exact time that it comes up is not so well defined that I would use the words "real time" associated with it because when we press the button, we generally hold it down and there is no critical interval associated with that.

Q. I understand, but isn't it a fact that the displays on a pinball machine are really the same as a display on the calculator? You just have to respond with the display sufficiently fast that the person operating it isn't disappointed with the operation of the device, correct?

A. I don't agree with the statement, sir.

Q. With the scoring displays, for example?

A. The -- my understanding of the intended operation via

game rules of lamps and scoring displays is that there is a rhythm to the game, such as that the electromechanical pinball games had; that is, for example, when a target is hit, a light is lit and there is a real response associated with that; and similarly, as you play it, the rhythm of seeing digits displayed in sequence and things like that allows you to assign a number to that. I don't myself have the same feeling about a calculator.

Q. Is it true, though, if I push the 8 on this calculator, or 7, that display responds in a time adequate for a pinball machine; wouldn't you say?

MR. SCHNAYER: I object on the grounds of relevancy. There is no indication that that calculator was available at the time the invention was made. He is using a calculator that could have been designed at any time.

THE COURT: Overruled.

THE WITNESS: May I ask you to repeat the question, please?

BY MR. LYNCH:

Q. Sure. I will ask you to look at this calculator. You know what calculators were like in 1972, '73, '74?

A. Yes.

Q. You push the 8 and the 8 would light up, correct?

A. That is correct.

Q. Instantaneously, correct?

A. Not instantaneously.

Q. Well, how long would it take?

A. When we were doing the, looking at the example in the MCS4 manual, if you recall, it carefully taught that when you depress a button on the calculator, that you should scan it again and again and again to debounce it, and so depending on how one does that, one ends up with a response time of a digit on a calculator which could be far longer than would be permissible in a pinball machine.

Q. Well, how long is permissible in a pinball machine, do you know? Do you have a figure?

A. The events in a pinball machine that Frederiksen discussed, he was basing them around the number of 30 milliseconds, as I recall from his testimony, which would mean that from the time a switch was closed, he used the word -- the number 30 milliseconds for the duration of the closure of a switch. The real time response then that is required is from the time the switch closes until you detect it is closed and light the light, and that's a human reaction time.

I don't know and haven't measured what a good pinball player would expect from that, but I would expect it to be far shorter in time than what anyone normally expects from a calculator.

Q. Okay. Well, suffice it to say, however, that you do know that some of the scoring that goes on goes on after the ball

goes out the out hole?

A. Well, I played the games, I observed just that, and actually, according to a pattern which, again, would have to be enforced in real time to preserve that rhythm I mentioned.

Q. Oh, I see. So that scoring is in real time also, even the scoring that occurs after the ball comes out of the out hole?

A. In the design of a real time system, any constraint that arises from either game rules or the expectation of the users that have to be time enforced are real time constraints, that is correct. You cannot ignore them without changing the expected behavior of the system.

Q. And even the displays, there is a rhythm about the displays, is your testimony?

A. When I played the game, I noticed such a rhythm in the scoring displays, that is correct, some of the scoring displays.

Q. Mr. Frederiksen testified about the real time constraints of the ball on the playfield hitting a switch and having it get kicked off, correct?

A. He mentioned that as a real time response, that is correct.

Q. And that's a real time restraint we can all agree on, isn't it, Dr. Schoeffler?

A. I agree that is a real time constraint.

Q. Because there you have to respond while the ball is on the switch, correct, or the ball is on the thumper bumper, correct?

A. You have to respond in time so that you can hit away with the solenoid, and I would assume that that's the same interval when the switch is closed.

Q. Now, there are claims in this -- I would like to refer you to Claim 51, for example.

(Brief pause.)

A. I am actually reading 50 first.

Q. Well, 50 is fine. You needn't go to 51.

A. All right. (Reading patent.)

Yes, sir.

Q. Now, Claim 50 says on the thumper-bumper you have to respond while the ball is on the switch. Correct?

A. Claim 50 says that you must complete the circuit so that the signaling means are coupled in, and so in order to read the switch you have to read the switch when it's closed, so the ball would have to be in contact, that is correct.

Q. And you have to read it in time to respond, in a bumper, correct?

A. Claim 50 does not say that.

Q. Then read Claim 51.

A. Yes, sir. (Reading patent.)

I've read Claim 51.

Q. Now, Claim 51 does say: "The speed of the processor" -- et cetera -- "being sufficient to respond to provide the driving action by the bumper while it is still in contact with the bumper." Correct?

A. That is what it says.

Q. So that's an express recitation of a real time constraint. Is that not correct?

A. That is correct.

Q. Claim 50 is one of these claims not in suit.

A. Excuse me, sir. That's Claim 51.

Q. 51. I'm sorry.

Now, your testimony is that insofar as Claim-- it's an express recitation of a real time constraint.

Now, insofar as Claim 46 -- 45 is concerned, you say the real time constraint is imposed just by the word "operatively." Correct?

A. (Witness reading patent.)

The word "operatively" is used in three specific places in Claim 45.

Q. And does it mean Claim 45, by use of the word "operatively" inherently implies real time?

A. To understand the meaning of Claim 45 and its use of the word "operatively" I went back to the specification and saw specifically what was disclosed in the specification, and that is real time response, in the specification in several different sections.

Q. Well, we'll get to that.

But the word "real time" doesn't appear in the specification, does it?

A. Yes, the word "real time" does appear in the specification.

Q. We'll get to that, also.

Let's get to error recovery, we'll get to error recovery.

A. Yes, sir.

Q. Error recovery, is that expressly recited in Claim 45?

A. Error recovery, the way I use the word, is part of the real time constraint.

Q. Well, could you explain how error recovery is recited in that claim?

A. The claim uses the word "operatively" to describe how things are done. And the specification indicates the meaning then of the real time and the error recovery.

Q. So the real time constraints and the error recovery constraints are included in the word "operatively," is that correct? Claim 45?

A. They are part of the meaning of the word "operatively," if that's what you mean by included.

Q. Okay, then, let's change it: "part of the meaning of the word operatively."

Let's go to noise, noise prevention and noise immunity: Are either one of those items recited in Claim 45?

A. Yes, sir. The word "operatively," where it's used three times, and the meaning of the patent, gives rise to the definitions -- the inclusion of the noise prevention and immunity considerations separately.

Q. "...part of the meaning of the word operatively."

A. Yes, sir.

Q. Now, of course, there are some other claims that talk specifically about some of the constraints that you mentioned

as noise constraints, aren't there, Dr. Schoeffler?

A. I'm not certain. I'd have to read through all the claims.

Q. Well, let me ask you to look at Claim 30.

A. 30.

(Brief interruption.)

THE WITNESS: I have read Claim 30.

BY MR. LYNCH:

Q. NOw, Claim 30 does discuss one of the noise abatement techniques that you discussed, correct?

A. That is correct.

Q. The opto-isolator, correct?

A. That is correct.

Q. Is that a noise prevention or noise immunity technique?

A. That is a noise prevention technique.

Q. So 30 recites the opto-isoloator expressly, correct?

A. One of the opto-isolators, that is correct.

Q. An opto-isolator.

How about Claim -- as another example, how about Claim 29? What does that recite?

A. I am reading Claim 27.

(Brief interruption.)

THE WITNESS: This discusses the current limiting to the lamp through the low beta transistors specifically in Claim 29.

BY MR. LYNCH:

Q. Is the low beta transistor something you discussed as a noise-abatement technique?

A. Yes, sir.

Q. Is it a noise immunity or noise prevention technique?

A. It is a noise prevention technique.

Q. So we can put 29 up here and put the low beta transistor. That is expressly required, also, correct, expressly recited, correct?

A. In Claim 29.

Q. In Claim 29.

Do you know if there are any expressly recited noise immunity techniques in the claims?

A. The word, operatively, where it appears in every claim, when reading the specification, which includes the computer program, has several noise immunity considerations mentioned.

Q. Does the word, operatively, include all of them that you have discussed?

A. The word, operatively, as defined in the specification means that the combination of noise prevention and noise immunity techniques that you build into a game are adequate to have the system respond in real time according to the game rules.

The specific noise immunity techniques disclosed in the program and in the text of the specification are not necessarily required.

Q. They are not necessarily -- pardon me?

A. The specification --

Q. The last word. I just did not hear it.

A. Required.

Q. Well, let's go to them, and let's pursue the ones you discussed in the specification.

Do you need a copy of the colored-up patent, Dr. Schoeffler?

A. I have it in my notes. May I get them?

Q. Well, I just would like you to have a copy of the colored.

A. I have a colored copy in my notes.

THE COURT: Well, let's take 10 minutes.

(Brief recess.)

Q. Dr. Shoeffler, you did testify from the specifications or patent and pointed out a number what I guess could be referred to as noise abatement techniques or items that appeared in the specification?

A. That is correct.

MR. LYNCH: May it please the Court, your Honor, for purposes of identification, I would like to mark the chart having matrix multiplexing, real time, error recovery and noise down the left-hand column in the claims in suit and claims not in suit across the top as 19-D.

BY MR. LYNCH:

Q. Now, do you have a copy of the patent colored in that fashion?

A. Yes, I have Exhibit 3-A.

Q. That is Exhibit 3-A. The very first item relating to noise, you indicated, appears at column 3 lines 27 down to line 36, correct?

A. Correct.

Q. Now, is the noise immunity or noise prevention expressly discussed anywhere in that part of the specification?

A. Yes, sir.

Q. Where does that appear?

A. It appears in a, in the words "microprocessor suitably housed in the back housing wall or box of a pinball unit, coupled through a 16-slot matrix board in combination with a

continuous test and interlock system to maintain interlocking control of the system."

Q. Which part is the noise abatement part of that?

A. The -- I didn't use the word "abatement".

Q. Well, I will use the word you want, Doctor. I am using the word "abatement" to mean immunity and a prevention together so I don't have to use all those syllables, that's all.

If I tell you that that's the only reason I am using "abatement," can we agree on that word?

A. The reason I was careful to use the word "prevention" and "immunity" is that prevention implies a hardware or a physical structuring; the immunity is normally implemented in software and there is a distinction.

Q. Let's stay with prevention and immunity then.

Where does it specifically indicate -- well, first of all, what is this, noise prevention or noise immunity?

A. There is both in this area.

Q. Where does it specifically say this is how you achieve noise prevention?

A. The words "this is how you achieve noise prevention" are not explicitly in these lines.

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Q. Well, insofar as this continuous test and interlock system is concerned, Doctor, I want to refer you to the very opposite column of the patent, at line 16 and through to line 32. It indicates there that:

"An output port provides a drive means to the scoring boards and other auxiliary equipment. In addition a separate test input line is connected into the circuit through the multiplexing line to maintain a continuous monitor and interlock of the system for subsequent play."

Isn't that the same system that's referred to in your highlighted area as noise abatement -- or as noise technique-one?

A. (Witness reading patent.)

Not quite.

Q. No, but that's -- isn't that the same test and interlock system?

I'm not saying it says everything in your highlighted portion.

A. What is the same is the reference to the test line.

The interlock system in lines 27 through 36 is referring to the interlock of the switches and the test line, whereas in lines 16 through 20 I read that as referring only to the test line.

Q. It says: "Through the multiplexing lines to maintain a

continuous monitor."

Isn't that the test?

A. That is the test line, sir.

Q. "...and an interlock system" -- I'm sorry --"...and an interlock of the system for subsequent play."

Isn't that the same test and interlock system?

A. Both of those sections are discussing interlocking. And by interlocking we mean offset in time when we read switches, offset in time from other events such as noise producing lamps.

But the first one, lines 27 through 36, talks about applying the interlock system to both the test line and the switches. And that is exactly what is done in Frederiksen's program. It's just that the switches are not mentioned in lines 16 through 20.

Q. Referring in the right hand column, I would like to pursue with you, Doctor, whether or not it is in effect, down in that same paragraph we've been referring to in column 4, starting at about line 27, it says:

"The test line will respond to such a condition" -- and I believe there it's referring to a coin -- "any coin introduced by a player being automatically recorded."

It says, quote: "The test line will respond to such a condition to momentarily interrupt the usual

sequencing and automatically maintain a continuous record of credit conditions."

Correct?

A. That is what the sentence says, that is correct, sir.

Q. Now, that is merely saying you want to make sure that the customer gets credit for all his coins, correct?

A. That is correct.

Q. And the next sentence says: "Similarly, a tilt condition will take precedence and provide automatic processing of the tilt condition."

Correct?

A. That is what the sentence says.

Q. Now, are not those two functions the interlock system functions that are referred to in this patent?

A. No, sir.

Q. You say the interlock system functions is the idea that you must sense the switches at a time different than you're doing other things.

A. That is my understanding from the specification of the word interlocking.

And, of course, these are the functions that you are carrying out when you read the switches on the test line. But the word interlocking is the sequencing in the program of this.

Q. Permit me to understand: The interlock referred to,

according to you, Doctor, is some type of control that makes sure that switches are not read while there are lamp actuations or solenoid actuations going on, is that correct?

A. More specifically, in the patent, doing that by offset in time.

Q. Offsetting them in time.

Now, it never says that in the written English specification, does it?

A. It says that in the program, which is part of the specification.

Q. But it never says that in the written English specification, that is: It is advisable to scan the switches at a point in time removed from the time when the lamps and solenoids are to be actuated.

A. It does say that.

Q. Where does it say that in the English part of the specification?

A. I will have to search for it.

Q. Now, are you referring to the transistor?

A. The discussion associated with the transistor, that section.

Q. Is the transistor then the same as the interlock?

A. No, sir.

Q. Then let me ask the question this way.

MR. SCHNAYER: I object, your Honor. He is looking through the patent trying to answer a question, and Mr. Lynch is cutting him off. If you want to withdraw the previous question --

THE COURT: Well, I think Mr. Lynch has and has gone on to something else.

MR. SCHNAYER: I am sorry.

BY MR. LYNCH:

Q. I understand that you were going to get to the transistor.

Does it say anywhere that the interlock system, the interlock system, provides the separation in time between switch scanning and lamp actuation as opposed -- and solenoid actuation?

Let me ask that again.

Does it say anywhere that the interlock system provides this difference in time between switch scanning and

solenoid actuation and lamp actuation?

A. When I look in the specification to determine the meaning of those words, that is what I determined.

Now, to find out where, unfortunately, I will have to read the specification carefully again.

Q. Are you aware, Doctor, that there were interlocks on electromechanical games?

A. I am aware of the use of the word, interlock, in relay logic systems.

Q. In electromechanical pinball games?

A. Yes, I am.

Q. What were the interlock systems and electromechanical pinball games designed to do?

A. The only example that I can come up with from my study of the Bally book on electromechanical games had to do with deliberately opening relays and locking out further play when a tilt condition came about.

Q. The tilt condition on an electromechanical game is an interlock function, correct?

A. I believe that is correct.

Q. That means on an electromechanical game that when you tilt the machine, all other bets are off, correct?

A. That is my understanding of the operation of an electromechanical game.

Q. Similarly, in an electromechanical game, when you put a

coin in, regardless of what is going on in the game, that coin is supposed to register, is it not?

A. I am not certain of that.

Q. You are not certain as to whether coins provided an interlock function as well on electromechanical games?

A. I would have to go back and review that manual again for that.

Q. At any rate, that is an interlock system, the tilt interlock system, that has to be duplicated on any pinball game, don't you agree?

A. I am sorry. Would you repeat the question, please?

Q. A tilt interlock system has to be implemented on any pinball game whether it is microprocessor controlled or electromechanically controlled?

A. When the tilt event occurs, it must be responded to no matter how you build the controller, that is correct.

Q. It is indicated here that there is an interlock condition that creates credit as well in the game of Mr. Frederiksen's patent, correct?

A. Where were you reading, sir, please?

Q. At column 4, line 19 specifically.

A. That is what it says.

Q Now, so we know that there are interlock systems and it would make sense to you that a similar interlock system on electromechanical game, that is, when a coin goes in, it is registered?

A. Yes. I would have interpreted the word "interlock" in that case to lock out accepting of the coins rather than accepting them at any time, but --

Q If you were an arcade operator, under what conditions would you want to lock out coins?

A. As an arcade operator, never. But as a game designer of logic, it may be necessary so that you can actually respond to and register the coin.

Q So it is your testimony that, going back to noise abatement -- sorry. Let me take that down. Noise technique 1, that the interlock system there is an interlock system that has to do with scanning the switches at a time different than the time that the lamps or solenoids are actuated?

A. Yes, sir, this is what Mr. Frederiksen in his testimony called lag sensing.

Q Lag sensing. So fix No. 1 is lag sensing. Is it fair to say that the lag sensing aspect of that interlock system is only implied in this section, column 1, lines 27 through 36 -- colunn 3, lines 27 through 36?

A. Well, it says specifically interlock system.

Q But we know interlock systems will do things other than

cause lag sensing, correct?

A. My interpretation of the interlock system or the lag sensing is that we do the interlocking or the lag sensing in order to detect the tilt at a satisfactory point in time, not the opposite as you just described it.

Q. Is the interlock system a system to detect the tilt switch or all the switches?

A. The interlock system is a system that allows you to scan switches in as noise-free, noise-immune manner as you can. Among those switches will be the tilt switches, all the other switches on that high priority test line, and the switches in the switch matrix.

Q. All right. Let me ask you this then, Dr. Schoeffler: Is it the case that in order to determine that an interlock system works in that fashion, you must have reference to the software?

A. The later reference associated with the transistor base, as I recall, specifically mentions the lag sensing. And so that place, plus the program, are the two places that come to mind without further searching.

Q. So is that the low beta transistor?

A. I'd have to find the location in the patent, because there are words there specifically, as I recall.

Q. I can find it for you readily, Doctor.

A. Thank you.

Q. Try item 15, Doctor.

THE COURT: What was your reference?

MR. LYNCH: Item 15, the very last yellow one, your Honor.

THE COURT: Yes.

BY THE WITNESS:

A. I believe that is the one I was referring to, without searching through the others, I think that is the one I was referring to, yes, sir.

BY MR. LYNCH:

Q. So is noise technique No. 1 then, we could call that lag sensing,correct?

A. Yes, sir, if you interpret lag sensing to be equivalent to interlock, interlocking.

Q. Would you prefer me to put "interlock"?

A. Yes, sir, I would.

Q. We will put "interlock" down.

Now, your testimony is that's the same as item 15, at least in part?

A. In part, yes.

Q. Same as item 15?

A. In part.

Q. In part. What else, the remainder of it is software?

A. I'm sorry, sir, the remainder of it?

Q. Well, let's forget about the other part. The part that

isn't 15.

A. I thought you were --

Q. The part of the interlock noise technique that is not embodied in item 15.

A. I'm sorry, sir, I thought that you were referring to that 15 includes more than interlocking in its discussion, so it is 15 that has more in it than interlocking.

Q. Okay, so interlock is the same as 15, same as part of 15?

A. Yes.

Q. Same as part of item 15. Correct?

A. That's correct.

Q. Now, but it includes -- when we get to 15, we'll find out what the other part is, correct?

A. Yes, sir.

Q. Now, if the transistor provided for or discussed in Item 15 is in the circuit, is that interlock characteristic satisfied by the circuit?

A. That characteristic is software implemented, that is, it is the program that implements the displacement in time in the specific embodiment disclosed in this patent, namely, the sequencing in the program.

The transistor is a hardware noise prevention mechanism.

Q. But the interlock mechanism -- oh.

Forgive me, Doctor. I wanted to know if the interlock mechanism involves use of a transistor, involves use of software, involves use of both.

A. In the Frederiksen implementation disclosed in the patent the interlocking is produced by software; it is the sequencing that takes place in his executive loop.

It is made possible and feasible by the hardware noise prevention mechanisms.

Q. Let me make sure I have that, then.

Item 1, the interlock, is implemented in software. Correct?

A. That is correct.

Q. And is made possible by using --

A. Made feasible.

Q. -- made feasible by hardware.

A. By hardware noise prevention.

Q. That, and you're speaking about the transistor?

A. That is one of the hardware noise prevention mechanisms, but it's only one of them.

Q. You mean there's more hardware that's needed to implement this interlock?

A. Yes, sir.

Q. What?

A. All of the hardware noise prevention technique --

Q. First of all, the transistor. Now, what else?

A. The word transistor is not specific enough. There are actually two uses of that word: One with the adjective low beta, which is associated with the limiting of the current pulse into the lamps --

Q. Okay.

A. -- and the second with the adjective slow turn-on.

Q. There's a low beta transistor and a slow turn-on transistor?

A. They're used separately in the disclosure, that is correct.

Q. Okay. Now, are they two different transistors in Figure 5? In the patent drawing, are they two different transistors?

A. Without going back and reviewing the specification carefully, my recollection is that the slow turn-on transistor is in the columns of the matrix; and the low beta transistor is in the lamp drive row, as indicated right there.

Q. The low beta transistor is Item 88, correct?

This is 88.

A. Yes.

That is correct. And the disclosure discusses, although it doesn't show, column transistors; and the slow turn-on, it was my interpretation, was the column transistor, as I recall.

Q. So there was a slow turn-on transistor which I think we will get to in a moment, when you highlighted it in yellow at a subsequent part of the specification.

So we'll do that, and come back to this: Any other hardware that's discussed that needs to be present in order to make this software implementation feasible?

A. As I answered a moment ago, all of the hardware prevention techniques are applied in order to minimize the amount of noise present in the system; and whatever is not taken care of by hardware we do the best we can with software in noise immunity.

So the other ones --

Q. Well, I don't mean to interrupt you, Doctor --

A. Okay.

Q. I just want to know the hardware necessary to achieve this interlock. I don't want to know all the hardware. I want to know the hardware necessary to achieve the interlock.

Now, we have: The interlock is implemented in software and is made feasible by hardware. And you gave me two items of hardware that make that interlock feasible.

Now I want to know, is there any other hardware that makes that interlock feasible, that is required or that is needed to make that interlock feasible?

A. All of the hardware mechanisms contribute to that, because anything that cuts down the noise in the system will change the way the program can be organized.

Q All hardware contributes. I will write that down.

Now, way over here I just want to keep a column just so we can keep track of some things.

Claim 29 recites the low beta transistor, isn't that correct?

A That is correct.

Q Claim 27, I believe, also calls for a transistor.

Is that the slow turn-on transistor?

A No, sir. That is the low beta transistor.

Q 27 is the low beta as well?

A Yes, sir.

Q So they are both the low beta, and 29 says low beta?

A That is correct. Claim 27 does not say low beta. 29 includes Claim 27 and specifically adds the low beta requirement to the claim.

Q Fine.

Let's go to noise technique No. 2 in the specification.

Now, in item No. 2, is the noise technique or noise control technique expressly stated, or is it implied?

Now, item No. 2 appears, of course, at column 3, lines 54 through 65.

A Column 2 specifically indicates that the peak inherent current limiting on cold lamp start is carried out, and limiting the peak current pulse is clearly a noise prevention

mechanism.

Q. Well, it says that the reason is to be current-limiting on cold lamp start to further increase lamp life. That is what expressly says, is that correct?

A. That is correct.

Q. It does not say anything about noise.

A. It does not specifically say anything about noise, but it is obvious that limiting the size of the current pulse to a smaller value will reduce noise.

Q. So it is implied, correct?

A. If implied means the words, noise prevention are not present, that is correct.

Q. Well, here is your testimony.

When you got to item 3, you said, quote:

"Now, this one specifically mentions noise immunity, noise immunity that we have been referring to, whereas in the previous one we had to infer it."

That is page 928 of the transcript.

A. No, sir. That is referring to item 3.

Q. It says in the previous one, item 2. We had to infer it.

A. I am sorry. Let me read it again, please.

(Brief interruption.)

THE WITNESS: I must have misunderstood your question.

Would you please repeat it?

BY MR. LYNCH:

Q. I am saying in this case when you testified originally, you indicated that any noise immunity in noise technique No. 2 had to be inferred?

A. Yes, sir.

Q. Well, people infer; documents imply, isn't that correct?

A. I will accept that.

Q. I will put infer, Doctor.

Now, the low beta transistor is Item 88, correct?

A. That is correct.

Q. As we indicated, that is the subject of Claim 29, correct?

A. That is correct.

Q. So insofar as the hardware is concerned, the hardware of noise technique No. 2 is the same hardware that we have discussed earlier as being necessary to make feasible the software implementation of the interlock?

A. The low beta transistor hardware, because it is a noise abatement procedure, contributes to the software immunity techniques, that is correct.

Q. Now, let's go to Item No. 3.

That is the other transistor, correct?

A. That is correct.

Q. Now, this other transistor is recited in noise technique

No. 3, commencing at the last line of column 3 and going through line 10 of column 4, correct?

A. That is correct.

Q. Is that transistor shown in Figure 5?

A. That transistor is not explicitly shown in Figure 5 of the patent.

Q. So, but if we were to have it and put it in, it would have to be placed in on one of the column lines, on one of the decoder lines, correct?

A. On each of the decoder lines.

Q. On each of the decoder lines, and it would be, for example, in the position I have circled on the placard of Figure 5?

A. That is correct.

Q. Now, that device is not the low beta transistor, correct?

A. That device that you inserted in the decoder lines is specifically to be a slow turn on transistor and the transistor labeled 88 was specifically mentioned as a low beta transistor. There would be no restriction that it not also be a low beta transistor if it is also a slow turn on transistor.

Q. Is it not the case, Doctor, that low beta is a characteristic that will result in slow turn on?

A. Many -- I don't know what fraction of the low beta Darlington power transistors also have relatively slow turn on compared to higher beta Darlington transistors, that's correct.

Q. So effectively, this could be another low beta transistor, correct?

A. If it was also a slow turn on transistor, that would satisfy what Frederiksen disclosed in the patent here, that's

correct.

Q. Now, is this the insert, a time lag into the circuit, is that where you are getting slow turn on?

A. That's correct. It is not a time lag. It is specifically a slow turn on, which causes a lag in the time at which the current pulse rises to its maximum value, but it does not displace it in time, which would be the connotation you would associate with the word "delay" or "lag". In other words, there is a smoothing of the turn on to minimize the noise.

Q. And the turn on time of the transistor inserts a time lag, is what it says, correct?

A. Yes, sir.

Q. Now, you want to call that a slow turn on transistor?

A. Yes, sir.

Q. Now, I would like to refer you to Claim 27. I inserted on the chart that Item No. 3 was not shown in Figure 5, and that is correct, the slow turn on transistor?

A. That is correct.

Q. Claim 27, does it recite a transistor in the position that I have indicated on Figure 5?

A. You have indicated two transistors on Figure 5. Which one are you referring to, sir?

Q. Let me label it 3. In the position marked 3, does Claim 27 specify a transistor which could, in the position 3 as I have inserted it on Figure 5?

A. No, sir.

Q. I have inserted it on Claim 5 in communication with the lamps as a display, the lamps are a display?

A. In Figure 5 you mean?

Q. Yes.

A. That is not the transistor. The transistor you labeled 3 cannot be the transistor described in 7 -- I'm sorry, 27.

Q. Well, I didn't put a transistor in that position connected to a voltage source, but I am assuming that if you had a transistor in position 3 connected to a voltage source, it would respond to the constraints of Claim 27.

A. The line in which you inserted that transistor is intended to bring the lamps to ground, that decoder ground the lamps. The power is supplied by the rows, not by the columns. And Claim 27 explicitly mentioned a power source associated with the transistor, and that would be then the power that drives the lamps in the rows.

Q. Okay, I understand.

So then this transistor No. 3 is not mentioned anywhere in the claims -- or is it, to your knowledge? Expressly?

A. In the claims?

Since I didn't review all the others, I would have to review them.

Q. It's not mentioned in Claim 45, expressly.

A. It is mentioned via the word "operatively" in Claim 45, yes, sir.

Q. Only by the word "operatively."

Let's go to noise technique No. 4.

Now, noise technique No. 4 appears in the patent at just lines 11 through 15 of column 4, correct?

A. That is correct.

Q. Now, effectively what you indicated was that noise technique No. 4 was using the KBP instruction, correct?

A. More correctly, noise immunity technique 4 is the detecting of two switches apparently closed at the same time in the same column, and is disclosed in the specification.

That's an unlikely occurrence and is taken to be noise. The KBP instruction is the mechanism by which the program determines that.

Q. Now, does it say that in the highlighted portion you have indicated as being noise technique No. 4?

A. What is explicitly indicated --

Q. Does it say anything about two stuck switches?

A. What this item says is that 4, because there are four rows, four switches are read at a time.

The program shows, then, the reduction and the introduction of the noise immunity using the KBP instruction.

Q. So what you're saying is, the noise technique No. 4 is using the KBP instruction when you're reading four switches at a time?

A. No, sir.

I'm saying that the noise immunity technique is to detect two switches closed at the same time in the column.

It happens that in the specific embodiment, using the Intel 4004, the KBP instruction is very convenient. In another machine there would be other ways perhaps to do that.

Q. So what you're saying is that the noise technique is, what you have to do is to detect two switches at a time.

A. Detect two switch closures in the same column.

Q. Switch closures in the same column at one time.

A. That is correct, sir.

Q. And you read that into the highlighted portion in column 4 at lines 11 to 15.

A. That plus the program, sir, yes.

Q. So it's implied in the English part of the specification, correct?

A. That is correct, or inferred.

Q. Or inferred.

Now, I would like to pursue just for a moment with you, with the map -- refer to Figure 4 of the patent, if you would, Dr. Schoeffler.

(A brief interruption.)

BY MR. LYNCH:

Q. That indicates that if, for example, in the column marked No. 6, in the column marked 6 we'd be talking about the switches which are in the second bank of boxes from the top, correct?

A. That is correct. The switches are labeled A, B, C, and D targets.

Q. If one of these targets is down, for one reason or another, and a second target in the same column is actuated, then the microprocessor doesn't know which ones have been actuated, does it? In Mr. Frederiksen's implementation.

A. As Mr. Frederiksen described this, this process, if two switches -- if one switch is closed in that column, and then a second switch closed, when it is scanned, find two switch closures, at that instant it will be treated as noise and ignored.

The microprocessor does know which switches are closed.

Q. The microprocessor in the KBP instruction gets all ones.

A. At that point. But the value, the four bits, or the values of the switch that were read in, in Mr. Frederiksen's program, has been stored as the value read in in that column, because, as you recall, his error recovery is on a column basis, not on a switch basis.

Q. Okay. Suffice it to say, when two are down, it treats it as noise and does not respond. Is that correct?

A. As long as two are down it ignores the closure, that is correct.

Q. And you testified and Mr. Frederiksen testified how clever it was to put A, B, C and D target switches having the same scores in one column, correct?

A. That is correct.

Q. Now, it is the case that if we were to move over a couple of columns to column No. 4, we find the outhole, 500 targets, and the 1,000 bonus, correct?

A. That is correct.

Q. Do you know how many 1,000 bonus switches are in that one square, on the Flicker machine?

A. I'm sorry, I didn't understand your question.

Q. In this location in the mux map it says 500 targets, plural.

Do you know how many targets are enabled at that position?

A. I did not examine the switches of the individual ones to determine that, no.

Q. Well, I can tell you there are four -- two 500 targets and there are four 1,000 bonus switches, I believe, on the machine.

A. Yes, sir.

Q. Now, if one of the 1,000 bonus switches gets stuck, correct, what is going to happen to the ball after it goes out the outhole?

A. If the 1,000 bonus switch were to stick in --

Q. One of them?

A. One of them in a closed manner, and the ball went in the outhole. Then the ball would -- the system would, by its noise immunity, ignore it.

Q. It would ignore it, and what would happen?

A. If it were stuck in a closed position, which is unlikely to happen, as Frederiksen testified; namely, it does not fail in a closed position, which is why he put it in that column; but if it should fail in a closed position, nothing further would happen because it would continue to scan it and determine that those two switches were both closed and would not kick the ball out of the hole.

Q. It would not kick the ball out of the hole, correct?

A. That is correct.

Q. The machine would bomb, correct?

A. If the switch closed in the closed position -- failed in the closed position, that is correct.

Q. If any one of six switches in column 5 fails in the closed position, the Flicker bombs, correct?

A. That is correct.

Q. Now, let's go to column No. 3. The last one was column

4. It is the fifth column, but it is marked 4.

Let's go to the next column. It is marked as column 3.

Do you know how many switches there are as tens targets on the field?

A. No, sir. I didn't count them.

Q. How about six? Would that be logical with your inspection of Flicker?

A. I will accept your word for the six.

Q. And hundreds targets, four?

A. Yes, sir.

Q. And the pop-bumper, one?

A. Yes, sir.

Q. That means there are 11 switches in that column other than the 3000 hole, correct?

A. Yes, sir.

Q. What would happen if any one of those 11 switches sticks in a closed position and the ball goes in the 3000 hole at the top of the playfield?

A. I am not certain what the 3000 hole does, sir.

Q. The 3000 hole is this little hole at the top of the playfield that holds the ball. It says right around it, 3000.

Do we have a Flicker brochure?

(Brief interruption.)

BY MR. LYNCH:

Q. If we turn it on, if I may --

MR. SCHNAYER: Let me turn it on.

BY MR. LYNCH:

Q. If any one of the tens targets or the hundreds targets stick --

Here is the 3000 hole here. If any one of 11 switches in that column sticks and the ball goes in the 3000 hole, what happens to the game?

A. Frederiksen testified that those switches fail open, not closed. So it is an unlikely event.

Q. But let's assume it closes. Let's assume one of those 11 switches fails in a closed position.

What happens to the game?

A. If one of those switches fails, nothing happens to the game unless the ball goes into the 3000 hole.

Q. Then what happens when it goes into the 3000 hole?

A. If that unlikely event should occur, that a switch fails closed rather than failing open, as Frederiksen testified, the game would stop.

Q. The game would stop, and it would bomb, correct?

A. It would not bomb in the sense we were using the word, bomb, for the El Toro where we meant that the microprocessor stopped executing instructions..

In this case the microprocessor is continuing to scan, but it is detecting no further switch closures.

Q. It would not kick the ball out of the hole?

A. It would not kick the ball out of the hole, that is correct.

Q. So long as that switch, one of those 11 switches, in the column remained closed and stuck, the game would be inoperative effectively, correct?

A. If that event occurred, that it failed in a closed rather than an open position, as Frederiksen testified, that indeed would happen.

Q. And indeed in that unlikely event, also -- well, that would mean that there would be a total of, it would appear, 17 switches that could get stuck closed and effectively make the game inoperative, correct?

A. How did you arrive at that conclusion, sir?

Q. 11 in this column and 6 in the other column, in the outhole column.

A. If that were a problem, those switches would simply have been moved to the vacant columns as Frederiksen testified, and it would be no longer a problem.

Q. Well, it is true that one of these switches -- how much would you imagine a switch on the playfield of Flicker costs?

A. Two dollars.

Q. That much, two dollars for a switch? Two dollar switch can fail, correct?

A. Yes, sir.

Q. And it can even fail in the closed position, can't it?

A. Frederiksen testified that those particular switches are vertical and that when they fail, they break and they fall off and that they do not fail in their closed position.

Q. But they could become closed, the contacts that stick together?

A. It is conceivable.

Q. And they could lose their adjustment and fail closed?

A. It is conceivable.

Q. And in those conditions, any one of those 16 failing, the game is inoperative, correct?

A. If that happens on a specific game, it would be inoperative until it was, the switch contacts were cleaned again, that is correct, or adjusted.

Q. Now, that would mean that when this noise fix of KBP was inserted in the device by Mr. Frederiksen, he bought himself some problems also, correct?

A. I don't agree with that statement. He clearly indicated when he discussed his procedures that if you have a critical switch that, like the outhole switch or anything else that would stick and stop the game, all you had to do was either put it in the test line or put it in a column by itself, there are empty columns, he could easily have done that, and so I don't see that he bought himself any problems at all.

It was his feeling that these switches and the way he organized the operation of the game were adequate.

Q. Now, is there any discussion in the text of the patent about this way to fix double switch closures, in the text, the English text, not outside the software; we said it was inferred at the place highlighted.

A. It is clear in Figure 4 of the text, which is the matrix, that there are empty columns, that there are at least two columns in which there is only a single switch. And it is clear that in the test line that there is empty spots.

So, yes, it is clear from the text of the patent that anyone who understands how a switch would fail and could, a game designer would be able to determine and see some solution to that problem, in my opinion.

Q. Just so we can understand, we have 17 switches to take care of already, correct, in this game?

A. No, sir.

Q. To move out of the columns with the outhole and to move out of the columns with the 3000 hole.

A. No, sir, if there were a problem with the outhole, you'd move that one switch into an empty column and then your problems are gone. And thereare two empty columns for two holes.

Q. But he didn't do that?

A. He did not do it because he determined that that was not actually a problem in the Flicker game, an unexpected thing. It is clear it would be easy to do.

Q. Now let's go one further item. Let us assume that we did move the 3000 hole out, and under those circumstances, one of the 10 switches stuck.

A. Yes, sir.

Q. And you hit the hundred target. How many points would you get?

A. You would get the points associated with the tens target.

Q. Right, so you would get different points as well, correct?

A. That is correct.

Q. And so the ingenuity that you reflected about scoring really only applies to column 6, correct?

A. Error recovery, when an error occurs, keeps the game going in a degraded mode of operation. You do the best you can in an error condition. You cannot hope to solve all noise and failure problems, at reasonable cost at any rate.

Q. Okay, let me go on, Dr. Schoeffler, and ask you one further thing.

Other than Figure 4 and other than the software, is there in the text of the patent a discussion of solving the problem of two stuck switches in the same column?

In fact, is there any discussion of a stuck switch consideration, in the English part of the patent, the English words?

A. Somewhere in the patent, in the English words, there is a discussion of the matrix, and I would want to re-read it before I answered the question, but I can't recall where it is.

Q. Let's go to noise technique No. 5, Doctor.

Noise technique No. 5 appears in the patent at column 4, lines 33 through 40.

Now, you said that was both the noise technique and a real time implementation, according to the patent. Let's just focus on the noise technique embodied in No. 5. What is the noise technique involved?

A. The noise technique involved in this section is inherent in the matrix multiplexing of the lamps; namely, the self-cleaning feature, whereby the lamp is turned on repetitively rather than being latched on and, hence, error recovers straightforward fast.

Q. You say it is inherent in matrix multiplexing. Isn't it inherent in multiplexing? Cyclic and sequenqial multiplexing, I mean.

A. As I indicated, answered earlier, the word "multiplexing" in the patent means matrix multiplexing. The word "multiplexing" in an engineering sense covers a variety of schemes. And so I would have to ask for, if you have a specific one in mind.

Q. Yes. Mr. Frederiksen's little array of lights.

A. Where we connect to one at a time. It would be self-cleaning in that form also, that is correct, sir.

Q. That was time division multiplexing, correct?

A. That was time division multiplexing, that's correct, but non-matrix multiplexing.

Q. And so it really, the self-cleaning aspect is inherent in time division multiplexing, that is cyclic and sequential, isn't that correct?

A. That is correct.

Q. Now, that self-cleaning action is not expressly discussed anywhere in the patent, is it?

A. I don't recall offhand explicit use of those words.

Q. So it is, once again, inferred by --

A. Yes, sir.

Q. So I put down here next to noise technique No. 5, "Inherent in time division multiplexing that is cyclic and sequential inferred;" correct, you would agree with that, Doctor?

A. Yes,sir.

Q. Let's go to noise fix No. 6.

Now, noise fix No. 6 is an opto-isolator, correct?

A. That is correct.

Q. And it appears right below noise fix No. 5 in the specification at lines 40 through 46 of column 4?

A. That is correct, sir.

Q. Now, you identified that as a noise fix.

A. No, no, sir.

Q. It doesn't indicate itself as a noise fix, does it?

A. I did not indicate it as a noise fix. I indicated it as a hardware noise prevention mechanism.

Q. Hardware noise prevention mechanism?

A. Yes, sir.

Q. It doesn't say that at the designated portion of column 4, does it?

A. That is correct.

Q. It once again is unaffected, correct?

A. That is correct.

Q. So the opto-isolator is inferred and it is also the subject of a claim like I think Claim 30, isn't that correct?

A. Claim 30 mentions optical coupling, yes, sir.

Q. And it is the opto-isolator we are talking about, isn't it?

A. Without studying it, I believe that's correct.

Q. All right. Now, if we'd go to Figure 5, just so we understand this optoisolator, it doesn't mention it as a noise prevention technique or noise immunity technique in the specification, but it does mention it as a memory element. Isn't that correct?

A. Yes, sir.

Q. Now, the device appears, for example, at the -- an optoisolator, and I don't know it's the one we're talking about -- we're talking about the -- well, we're talking about no particular one at this juncture.

The device appears, for example, at 84. Isn't that right?

A. That is correct, sir.

Q. And at 84 we have a device where it's indicated that we want to be able to accept coins at any time and record them, right?

A. Yes, sir.

Q. And this is a cycling device. And if there's one switch closure you don't want to miss, it's the coin switch closure.

A. That is a critical one, yes, sir.

Q. You could afford to miss once awhile a switch closure on the playfield, just because of mechanical difficulty, a temporary glitch.

But you really don't want to miss a coin one, because the patron might get angry, right?

A. That's correct, sir.

Q. And another thing you don't want to miss is the flippers, because if the patron energizes the flippers and they don't respond correctly, they might become -- the game probably isn't playing satisfactorily, correct?

A. That is correct, sir.

Q. And so optoisolators are used as memory in both of those locations, isn't that correct?

A. That's correct.

Q. And what is meant by that is that this circuit lights a lamp and the lamp energizes -- the light from the lamp energizes the solenoid that will record the coin door actuations and the flipper actuations.

A. That's not precisely correct.

Q. Well, I said record.

It enables a solenoid, let's say.

A. More precisely, the lamp changes the value of the resistance which is in a circuit, et cetera.

Q. Okay. The lamp changes the value of this resistor, which means -- and when you strobe the lamp you keep the lamp on --

A. Yes, sir.

Q. -- and so as far as the resistor is concerned, although this line is being energized only so often, this resistor thinks it's on all the time?

A. That's correct, sir.

Q. And so effectively the coin door remains energized all the time, right?

A. That is correct, sir.

Q. Whereas in the remainder of the device, because of the multiplexing, you're really only looking at a column one-sixteenth of the time, correct?

A. That's correct.

Q. And this was a decision that with these two devices to use optoisolators as memory devices in order to make these respond 100 percent of the time.

A. The disclosure does not indicate that that is the only reason they were used.

Q. It's the only expressed reason.

A. Optoisolators have been used for noise prevention mechanisms in industrial control and other applications for many years. It's hardly a new concept.

And those happen to be the two locations where electrostatic noise is most likely to enter the machine. And so it is highly probable that those were put in deliberately there, and Frederiksen so testified.

Q. I understand. But let's talk about the very point you highlighted as noise fix No. 6.

It doesn't say it there, does it?

A. It does not say in this section of the text that the opto-isolators are there for noise prevention.

Q. And it doesn't say it anywhere else in the text, does it?

A. That is correct.

Q. Let's go to noise technique No. 7.

Noise technique No. 7 I will call the mother board technique. Is that fair, Dr. Schoeffler?

A. Yes, sir.

Q. Now, with respect to the mother board technique, is it the case that there's a discussion in the highlighted portion column 6, lines 29 through 36 of noise control?

A. The word "noise control" does not explicitly appear in those lines.

Q. Or noise prevention or noise immunity --

A. That is correct.

Q. None of that appears.

A. This is noise prevention.

Q. And so it's once again inferred, correct?

A. There is no reason for the inclusion listed in that section, and so the inference of noise is an obvious one in this case.

Q. Strong inference? Strongly inferred?

A. There is no reason specified for a mother board separate from the daughter board here. And that is a common practice for noise prevention.

Q. Well, let me ask you, the mother board contains what?

A. The mother board contains prime -- the mother board in Figure 2 contains, on one edge of it, all the heavy transistors and other circuitry for driving the power devices, like the lamps and the digits.

The daughter board contains the very light current circuits we associate with the microprocessor or the microcomputer.

Q. Right. Now, if you were operating with a pinball machine and you had to use a device like the Intellec, when you hooked up the Intellec to the machine you would have the microprocessor units embodied in the Intellec, correct?

A. That is correct, sir.

Q. In fact, on what you've referred to as the daughter board and what the patent refers to as the logic board, really contains the circuits that are represented by the Intellec, correct?

A. That is correct, sir.

Q. Now, if you were trying to experiment to develop a microprocessor control pinball machine, Dr. Schoeffler, you'd have -- at that period the Intellec was a good tool to use,

right?

A That's correct, sir.

Q And Mr. Frederiksen used it.

A He so testified.

Q And in order to have such a device, he would have had to have that machine complete with respect to all of its components except the microprocessor components that are contained on the logic board, correct?

A May I have the question back?

Q He would have -- in order for Mr. Frederiksen to experiment with the machine, the Flicker machine, as he was trying to adapt it to the microprocessor system, and he had the Intellec sitting next to it and he had the Intellec cabled to it, it would have been necessary that all of the remaining circuitry, including the circuitry on the mother board, be inside the machine.

A I don't agree with that.

In most of the other games that we have talked about, that use the Intellec or external electronics, most of the electonics was external, along with the Intellec.

Q. All right. Let's assume that's the case. Let's go on to this:

They would have had to be outside the Intellec machine; everything on the mother board has to be outside the Intellec machine, correct?

A. Yes, sir.

Q. So you have the Intellec machine which has the microprocessor; you have a board of high power devices, correct?

A. Yes, sir.

Q. Which is the same as the mother board, correct?

A. It could be the same as a mother board. In a development machine it is less likely that it would be the same.

Q. Well, suffice it to say, when Mr. Frederiksen went from an Intellec adaptation to a full microprocessor adaptation, what he did was put the Intellec contained components on a separate board, correct?

A. That is correct.

Q. And when he disclosed it in the patent, that he did that, he didn't say anything about noise.

A. I'm sorry, Mr. Lynch. I actually made a mistake on that last answer.

That wasn't quite correct.

Because of the special condition in the embodiment that Frederiksen used, namely, when he set up the rows corresponding to the lamps and the rows corresponding to

the digits, and selected the column, for noise prevention he wanted to strobe them both at the same time to take advantage of the slow turn-on transistor.

And so it is necessary to bring the command line off the Intel 4004 chip and onto all of the devices, like the decoders, the lamp drivers, and the like. That's the synchronizing signal.

Q. Yes. All I'm saying is, the chips that performed the function that the Intellec performs are on this logic board, or what you call the daughter board.

A. Without going back and reviewing Mr. Frederiksen's testimony right now, I don't recall how he handled that synchronizing signal, or whether he discussed how he tested it when he was using the Intellec.

Q. All I'm asking is this, Dr. Schoeffler: Is it or isn't it the case that the mother board contains the circuitry to make the device run, other than the microprocessor components?

A. That is correct.

Q. And when Mr. Frederiksen discussed this mother board, to which he added the microprocessor component board, and he discussed it in his patent, he didn't mention noise, did he?

A. Noise is not explicitly mentioned in that place in the patent we were just looking at, that is correct.

Q. It's inferred again, correct?

A. That is correct.

Q. I'll just write "inferred" next to Item 7. Moving along to Item 8.

THE COURT: I have another matter at 5:00 o'clock, so I think we'll have to quit now.

And we'll go from 9:00 to 10:30 tomorrow. And, unfortunately, tomorrow afternoon I've got a motion in a criminal case that's going to take all afternoon, and there isn't any way I can put it over.

So we won't have the afternoon as we had planned.

All right, I'll see you at 9:00 o'clock.

MR. KATZ: Your Honor, I have one matter in respect to schedule.

There is a program, a seminar, that has been already advertised that I'm going to be the chairperson of, on litigation against counterfeiting, product counterfeiting, and I'm going to be on the program with Judge Guy from the Eastern District of Michigan.

And that program was scheduled for March 19 through 21, which was a Monday, Tuesday and Wednesday. And I didn't -- these brochures went out last year.

THE COURT: Well, we can handle that. I mean, if we're still on trial at that time, we'll recess.

MR. KATZ: Thank you, your Honor.

THE COURT: I can always work in something else.

MR. SCHNAYER: Thank you, your Honor.

(Whereupon the within trial was adjourned at 5:00 p.m. until 9:00 o'clock a.m. of the following day, Friday, January 27, 1984.)